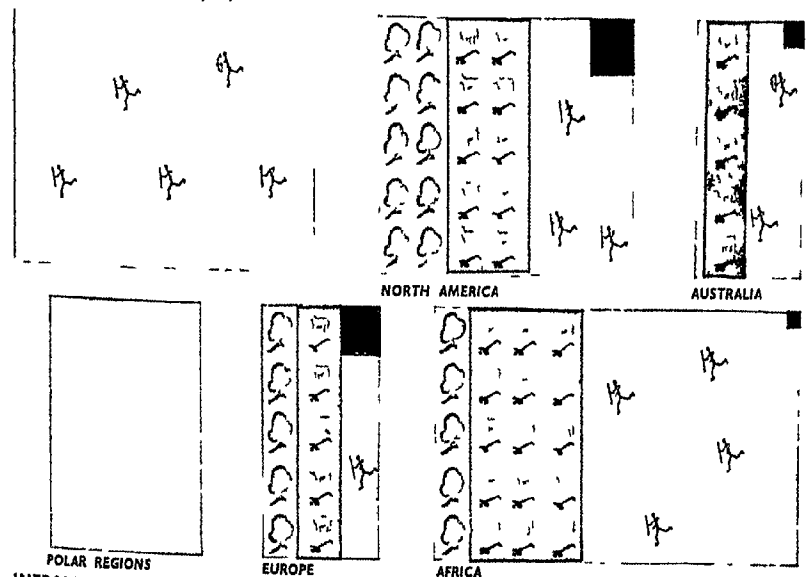
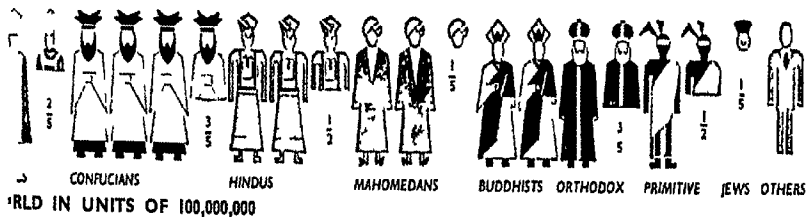
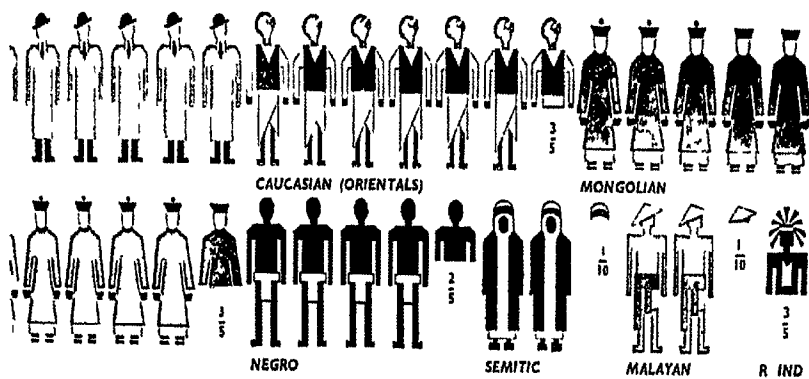
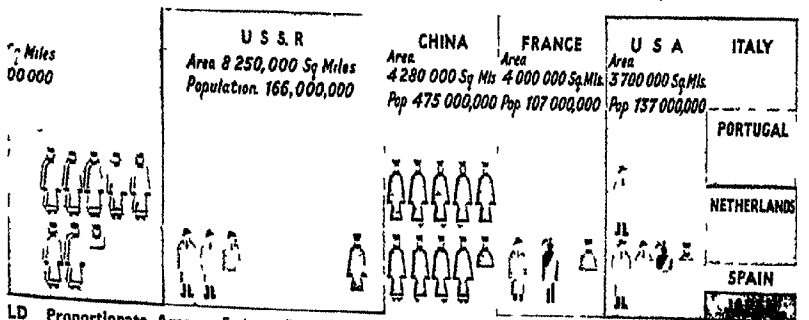


*To inspire ambition, to stimulate
the imagination, to provide the
inquiring mind with accurate
information told in an interest-
ing style, and thus lead into
broader fields of knowledge
such is the purpose of this work*

The New
PICTURED ENCYCLOPEDIA
Volume Eight



LAND USE OF THE WORLD Green patches represent approximate forest areas brown areas under both agriculture and unproductive land supporting primitive hunters red mining and manufacturing areas Continental areas are Asia 17 N America 8 Australia 345 S America 68 Polar Regions 5 Europe 375 Africa 115



LD Proportionate Areas Each small figure is a unit of 50 000 000 people and the diagram thus shows the proportionate areas of the five chief empires Areas and populations in millions of the smaller empires are Portugal 85 sq m Pop 16 Netherlands 8 sq m Pop 70 Spain 325 sq m Pop 25 Japan 26 sq m Pop 90

THE NEW PICTURED ENCYCLOPEDIA

A Pictorial Treasury of Reading
& Reference for Young and Old

Edited by
SIR JOHN HAMMERTON

Editor, Universal Encyclopedia, Universal History of the World, Peoples of All Nations
Countries of the World Encyclopedia of Modern Knowledge New Popular Educator

With Eight Thousand Illustrations including
nearly Eight Hundred in Colour & Photogravure

*Complete in Ten Volumes including Easy Reference Fact-Index
Study Outlines and Topics Guide to Every Day of the Year*

VOLUME EIGHT QUA—STU

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HERE AND THERE IN THIS VOLUME

At odd times when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. With this as a guide, you may wander through storyland, visit far-away countries, meet famous people of ancient and modern times, review history's most memorable incidents, explore the marvels of Nature and science, play games—in short, find whatever suits your fancy at the moment. This list is not intended to serve as a table of contents, an index, or a study guide. For these turn to the Fact-Index and Study Outlines in Volume Ten.

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WHEN YOU ARE IN NEED OF READY REFERENCE

In using THE NEW PICTURED ENCYCLOPEDIA as a work of reference, Volume Ten is indispensable. As regards its contents that particular volume is unique for it is at once a complete Index to the preceding Nine Volumes and an Encyclopedia in itself. Its purpose is fourfold, as indicated below

(1) **Through the Year with the N P E** Its opening section takes the form of a Calendar of the Year, giving for each day all the chief events and matters of interest, with references to the pages of THE NEW PICTURED ENCYCLOPEDIA in which full particulars concerning the event, personality, or other interest of the day may be found. By the intelligent use of this section (a) the young reader can have the daily delight of reading about topics that have special association with the particular day of the year on which he may be making his reference, (b) father or mother can suggest what would be the most appropriate reading for the day, and (c) the school teacher can set the lessons for the day with a genuine topical appeal.

(2) **Study Outlines** This large and important section of the volume provides a simple method of study which should enable any of our young readers to become expert in using THE NEW PICTURED ENCYCLOPEDIA as an auxiliary manual of home study and thus what is learnt in school may be amplified and more securely fixed in the memory.

(3) **The Fact Index** Actually this is in itself a complete Encyclopedia. In addition to providing many thousands of references to contents of Volumes One to

Nine, it records many more thousands of facts in biography, geography, history, science, the arts, etc., that are not mentioned in its nine predecessors. Therefore, if you look in vain for any subject in the alphabetical order of Volumes One to Nine, turn to Volume Ten and you will almost certainly find it there.

It is a good plan when using THE NEW PICTURED ENCYCLOPEDIA as a work of reference always first to look up any subject in the Fact-Index of Volume Ten

(4) **Thousands of Additional Entries** Not only are all the many thousands of statements of fact that appear in the main body of the work carefully recorded in the Fact-Index for your immediate reference, but many thousands of additional entries are given in this exceedingly useful section of our work. By this method the reading pages of the work are saved from the burden of thousands of brief cross references which the ordinary encyclopedic method would involve. These new entries in the Fact-Index together with the treasury of reading embodied in Volumes One to Nine make THE NEW PICTURED ENCYCLOPEDIA the most comprehensive encyclopedic work produced in the present generation and assuredly the most readable encyclopedia of its kind.

KEY TO PRONUNCIATION

Most of the subject headings in THE NEW PICTURED ENCYCLOPEDIA require no special indication of the way in which they should be pronounced. There are also many for whose proper pronunciation it is only necessary to know which syllable is stressed, in these cases the stress is shown *after* the syllable, thus A'jax. Where further guidance is necessary, the following signs are employed

ah = a as in father

av = a as in ball

e = vowel sound in fern, word, girl,
curl

ow = vowel sound in now, bout

oi = vowel sound in noise, boy

Unmarked vowels have their short
sound, as a in hat, e in bet,
i in bit, o in not, u in but,
oo in book

Marked vowels have their long
sound, as in hāte, bē, bīte,
nōte, tūne, bōon

Vowels in italics have a slurred or
obscure sound as in abet
(a bet'), recent (rē sent),
conform (kon form'), nation
(nā'shun), tailor (tā' lor)

th = first sound in thing, thank

th = first sound in the, that

zh = s in measure, leisure

g = hard g, as in good, girl

j = soft g, as in gem, ginger

kh = guttural in loch

LIST OF ABBREVIATIONS

The abbreviations most commonly used in this work are noted below. A much longer list of abbreviations often met with in reading or conversation is given in the Fact Index that is contained in Volume Ten.

A D, *Anno Domini* (in the year of our
Lord, of the Christian era)

a m, *ante meridiem* (before noon)

b, born

B C, before Christ

C, Centigrade

c, *circa* (about)

Co, county, company

d, died

e g, *exempli gratia* (for example)

etc, *et cetera* (and so forth)

et seq, *et sequens* (and following)

F, Fahrenheit

h p, horse power

i e, *id est* (that is)

lb, pound, pounds (weight)

m, miles

MS, MSS, manuscript, manuscripts

oz, ounce, ounces

p m, *post meridiem* (after noon)

Pop, population

Pron, pronunciation

q v, *quod vide* (which see)

sq m, square miles

St, Saint

U S A, United States of America

viz, *videlicet* (namely)

yd, yard



present form. They used the letter, as we do, with *u*, the combination *qu* having the sound of *kw*. In French *qu* generally stands for the *k* sound, as in *coquette* (pron. *ko let'*)

THE Egyptian picture sign Δ from which our *Q* is descended represents either an angle or a knee which, of course Δ forms an angle when bent. In the Egyptian script this sign takes a form Δ which begins to look a little like our *Q*. The Phoenicians formed it like this Φ and named it *Qoph*. Scholars disagree as to just what this word means. Some say it means 'ape' and that the character represents an ape with its tail hanging down. Another theory is that it represents an aperture of some kind, the eye of a needle, perhaps. Others think it is the picture of an ear and still others, that of a knot. As pronounced by the Phoenicians and Hebrews it was a very strong sound that did not need the help of any other letter. Its name and sound were similar to that of *Kaph* (the Phoenician *K*), but it was sounded farther back in the throat. We do not find the letter *Q* in the classic or modern Greek alphabet, for, although it once had a place there, it was dropped (except as a numeral) at a very early date. But the Romans kept it and gave it its

Quail. This bird (*Coturnix communis*), a cousin of the partridge, is famous for its habit of appearing suddenly in vast migratory hordes. You will remember that it was one of these swarms which, according to the Bible story, saved the Israelites from starvation on their journey into Palestine. The quail much resembles the partridge in colour and shape, but is a good deal smaller. You can tell the male bird by the anchor-shaped black mark running down the middle of its white throat. It still visits Britain, and sometimes nests here though it is by no means so common as formerly. This bird has a very wide range, being distributed pretty generally over Europe and Africa, and the northern parts of Asia.

During the spring and autumn migrations large numbers of quails are caught in nets for the market, the flesh being very delicious. In England they used to be attracted to the nets by a quail call, a little instrument with which the notes of the birds could be imitated.

Quails build their nests on the ground and lay about ten eggs, which are yellowish-white, spotted and blotched with brown. Like partridges, they search for their food among the field crops.

The many quails found in America are members of different genera from the Old World species.

Quantum Theory. When Lord Rutherford put forward his theory of atomic structure he realized that, unless the electrons outside the nucleus were whirling round it, they would be attracted by the nucleus. And if they were flying round the nucleus they would lose their energy until finally they fell into the nucleus. But it is known that this does not happen (See Atom and Atomic Theory, Rutherford, Lord). So, in 1900, Max Planck suggested that energy could pass in or out of an atom only in small units which he

called "quanta" (from the Latin *quantus*, so much). Niels Bohr further suggested that the moving electrons lost no energy, and that round every nucleus there were a number of "shells," like successive skins of an onion, in each of which one electron could fly round. If an electron was given exactly one quantum of energy it immediately leapt outwards into the next shell. If it fell to the next shell inwards it gave out just one quantum of energy and no more.

Newton suggested that light was a stream of particles or *corpuscles*. Subsequently John Dalton developed his atomic theory of matter (see Atom and Atomic Theory), and more recently still, Johnstone Stoney gave the name *electron* to the atom of electricity. In the meantime, the wave theory of light (see Light) had replaced Newton's corpuscular theory, but at the beginning of this century Max Planck found that the wave theory could not explain certain phenomena of radiation (See Radiation).



QUAINT LITTLE QUAILS

Our smallest game bird—it is only about seven inches in length—the quail is also one of the scarcest of the group of birds to which the domestic fowl belongs, known as the gallinaceous group. In this photo of a quail family one can see how closely it resembles the common domestic fowl.

As a result of this, he developed the Quantum Theory, which states that light, and all other forms of energy radiation, consists of small parcels or *quanta* of energy. These quanta are the units of all radiated energy just as the electron is the unit of electrical energy. But even then satisfactory results were not always obtained. The quantum theory was still unable to explain light interference, polarization, and wireless waves. Neither the quantum nor the

wave theory is alone sufficient to tell us all we want to know about light and energy.

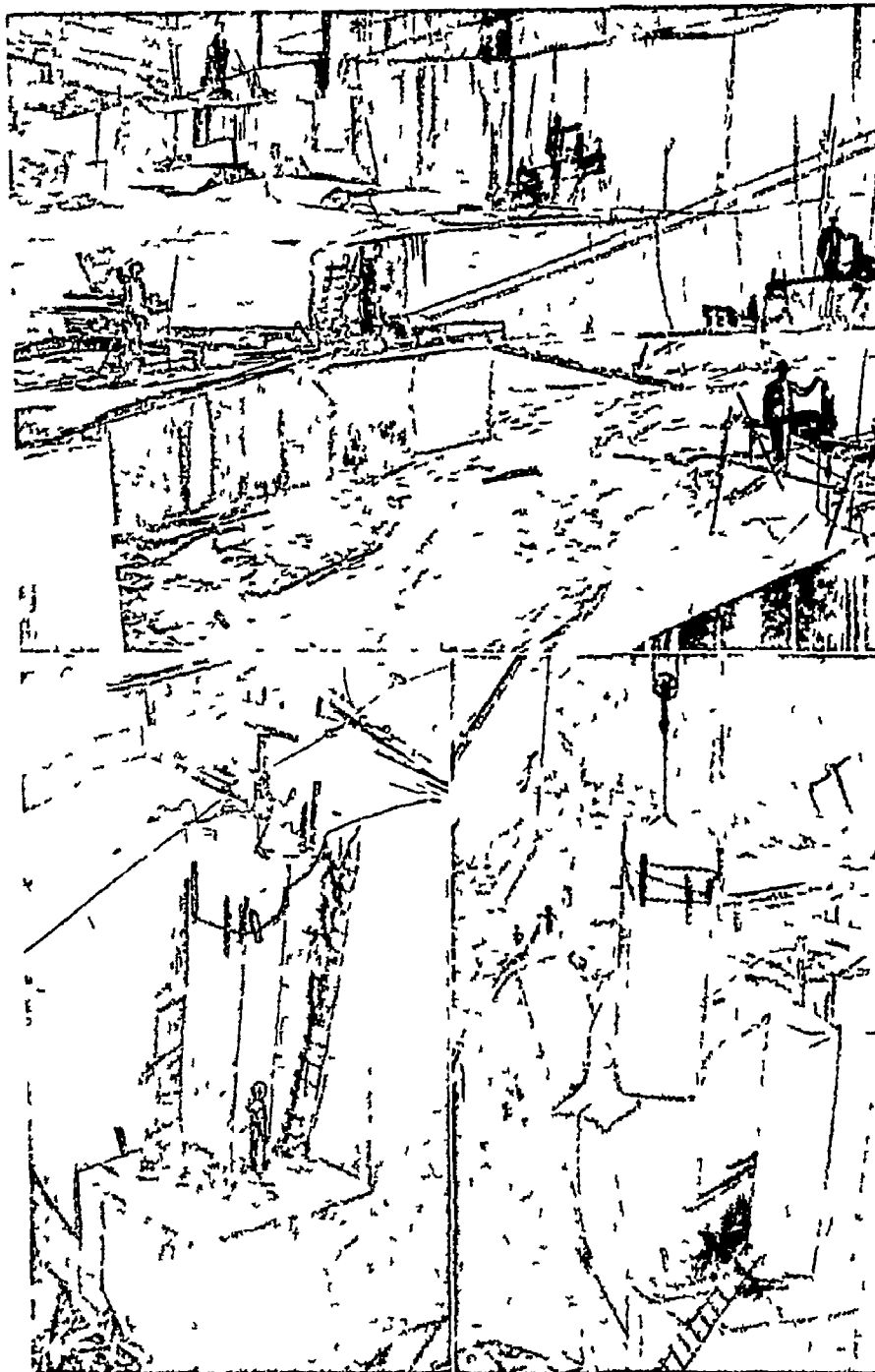
Although Newton advocated the corpuscular theory of light, he was not satisfied (as many people think he was) with it. In a philosophic moment, he suggested that perhaps light might consist of corpuscles, borne through space in waves, and leaders of modern thought on the subject, like Schrodinger, Heisenberg, and De Broglie, have produced advanced mathematical

analyses of the problem which indicate that this may be true. If so, the story of radiation will be a marvellous circle, starting with Sir Isaac Newton, running through centuries of controversy, giving us our scientific knowledge of light and electricity and such boons as wireless and X rays on the way, then coming back in the end to the Newtonian idea. This new development of the quantum theory is known to science as "wave mechanics."

Quarrying.

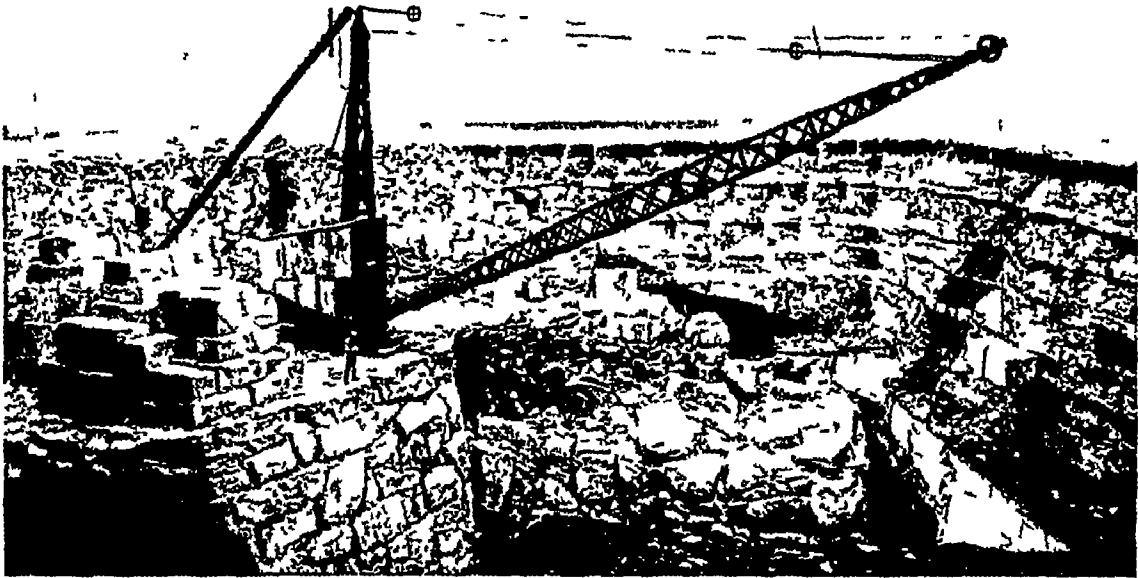
Throughout the centuries quarrying of stone has been done with hand tools, but machines operated by steam and electric power are now common. Rocks are divided into two kinds, stratified and igneous, according to whether they occur in parallel beds or have no distinct lines of cleavage. The stratified or sedimentary rocks, which include marble and limestones, slate, and sandstone, are the more easily quarried.

A visitor to a modern quarry finds "channeling" machines moving to and fro on their short tracks cutting furrows in the solid rock, enormous cranes swinging huge blocks from place to place, and light railways laid here and there on the rough quarry bed to haul out the slabs of



HOW MOTHER NATURE HELPS THE QUARRYMAN

As if Nature had meant the stone to be quarried, she frequently divides up rock masses as she has done in this marble quarry. First come the horizontal divisions, made in the laying down of the strata in the sea ages ago. Later come the vertical divisions made by the cracking of the rock when the earth's crust was uplifted or depressed. Thus great blocks can often be separated by merely driving in wedges, as you see in these pictures.



Geological Museum

WHERE PORTLAND STONE IS QUARRIED

Portland stone has been used for many famous London buildings, for example, Sir Christopher Wren used it in rebuilding St Paul's Cathedral after the Great Fire. This photograph is of a typical quarry in the Isle of Portland in Dorset, showing the building stone overlain by limestones and shales. The so-called "Isle" of Portland is really a peninsula and has about a hundred quarries, which are Crown property.

stone and carry off the strippings and refuse. Occasionally there is heard an explosion which is followed by showers of splintered rock, and always the air is filled with the sound of thudding drills and heavy hammers wielded by brawny arms. Rectangular masses of stone weighing many tons are loosened from the mother rock, great cranes swing them on to trucks, and these are sent to the stone mill.

In hand quarrying a row of holes is usually drilled a few inches apart along the line at which it is desired to break the stone. In each hole are placed either wedges or charges of blasting powder. By striking in succession all the wedges in the row, the splitting force becomes great enough to rupture the rock, or, where blasting powder is used, the explosion of the charges produces the same effect. High explosives, such as dynamite, are often used when the rock is to be crushed into small fragments for road construction, concrete making, etc.

Quartz. The two most abundant and widely distributed chemical elements, oxygen and silicon, combine to form the most abundant of all minerals, quartz, silica, or silicon dioxide.

The "igneous" rocks—those which once were molten masses—contain from one third to four-fifths quartz. As the water-laid or "aqueous" rocks, such as sand, are made from materials obtained by the wearing down of igneous rock or organic matter, so they too are likely to contain quartz, which is one of the most resistant of stones. Sometimes neighbouring particles of sand are cemented together with silica and built up into rocks again such as "quartzite" and sandstone.

Quartz is hard enough to scratch glass, but not as hard as diamond, sapphire, or topaz.

Sand and sandstone are used for making sandpaper and other abrasives, such as grindstones, polishing powder, soaps, etc., for building materials and for refractories or heat-resisting materials, for making paint and glue, and for small bearings for axles of fine machines. Clear natural quartz, called rock crystal, is valued for optical instruments.

Fused quartz shows virtually no expansion or contraction under changes in temperature, making it valuable for mirrors and lenses that must remain accurate in widely varying conditions, such as those used in telescopes, also for condensing lenses in motion-picture projectors, where the heat of the high-intensity arc light would break glass. It is one of the best electric insulators known. Almost as clear as air itself, it transmits heat rays, light, and ultra-violet rays better than any form of glass. Mercury-vapour lamps with tubes of fused quartz are powerful sources of the ultra-violet radiation used in medicine. Rays, visible or invisible, entering one end of a fused quartz rod will for the most part follow the rod round a right angle turn instead of coming out through the sides.

The Greeks named the transparent quartz *krustallos*—whence our word "crystal." The coloured varieties of quartz include many beautiful semi-precious stones, such as agate, amethyst, bloodstone, cairngorm, cornelian, cat's eye, chalcedony, chrysoprase, jasper, onyx, and sardonyx.

QUEBEC

FRAGMENT of FRANCE in OUR EMPIRE

*While they are loyal citizens of the British Empire, most of the inhabitants of Quebec are of French descent and retain the French language and customs
It is this that makes Canada a bilingual country*

Quebec, (Pron kwē-bek'), CANADA

If you were suddenly dropped into the Province of Quebec, the oldest and largest of the Canadian provinces, you might almost believe that you were in France. Most of the people are of French descent, and they have preserved their language, their Catholic religion and their customs.

The Province is much larger than France, occupying all of the great peninsula of eastern Canada lying between Hudson Bay and the Atlantic Ocean, save for the narrow Labrador strip along the Atlantic coast. Its area, which was doubled in 1912 by the annexation of the immense northern territory then known as Ungava, is almost equal to the area of France, Belgium, Spain, Sweden, and Norway combined.

Extent—Area, 594,434 square miles. Population about 3,000,000 (French speaking, about 2,700,000).

Physical Features—Rolling country and the Notre Dame Mountains (highest point, Jacques Cartier Peak 4,300 feet) south of St. Lawrence, level lowlands of St. Lawrence valley, densely wooded Laurentian Highlands. Chief rivers St. Lawrence and its tributaries.

Products—Hay, oats, barley, wheat, apples, and other fruit, maple sugar, cod and other fish, live-stock, butter and cheese, asbestos, cement, copper, lumber, textiles, pulp and paper, tobacco and cigars, fur and hats, boots and shoes and leather goods, machinery of all kinds.

Chief Cities—Montreal (population 865,000) Quebec (capital, 130,000) Verdun (73,000).

Most of these French Canadians live along the river St. Lawrence. The strip of 50,000 square miles which lies south of the river, the "Eastern Townships," was originally inhabited in part by descendants of English Loyalists who fled from the United States at the time of the

American War of Independence, these have been reinforced by subsequent immigrants from Britain and the United States. The famous mines which furnish two thirds of the world's supply of asbestos lie south of the St. Lawrence.

To the north the land is a great sparsely-inhabited plateau, dotted with many lakes and bearing immense forests of red pine and spruce. This is the region which makes lumbering the second most important industry of Quebec. Here, too, are to be found most



CHÂTEAU FRONTENAC, QUEBEC'S SPLENDID HOTEL

One of the most magnificent hotels in the world is the Château Frontenac, on Dufferin Terrace in the city of Quebec, over looking the river St. Lawrence. The statue (left) is of the Comte de Frontenac, French governor of Canada in the 17th century.

QUEBEC



Photo Royal Canadian Air Force

A LEGACY OF FRANCE—QUEBEC'S HISTORIC CITADEL

On the summit of Cape Diamond stand the time-worn defences of the citadel of Quebec. The citadel covers forty acres, and, though greatly extended a century ago, follows the main lines of the original French defence works of 1716. Behind the citadel in the middle distance, rises the imposing structure of Quebec's Parliament Buildings.

of the other mineral deposits—iron, copper, silver, gold, mica, molybdenite, and graphite.

The leading occupation of the Province is agriculture. Most of the farms in the older cultivated districts are small, frequently not more than 150 yards in width, and stretching back perhaps a mile in length from the river or road on which they front. This makes the countryside one of the most picturesque in the New World, appearing as a long line of small white houses, with curved red roofs, and ribbon-like strips of land stretching away behind.

On these fertile farms near Montreal the French Canadian families, which often include from 10 to 14 children, raise hay, potatoes, oats, barley, with some wheat, and maize. Round Montreal one of the principal crops is a strong-smelling tobacco. On some farms may be found orchards of apples, pears and plums. But most of the fruit, especially the famous snow apple, with its scarlet skin and snowy flesh, is grown near Montreal and in the "Eastern Townships," where are also large stock farms and dairies which produce huge quantities of butter and cheese.

The Province has a bracing and healthy

climate, with long cold winters rendered tolerable by the dryness of the air. The winter sports of Quebec city, the capital, and Montreal (*qv*), the largest city, are famous. The St. Lawrence, the gateway to Canada, and a magnificent system of smaller rivers and lakes abound in picturesque and noble scenery, and furnish cheap transport and water-power.

The Province of Quebec has a long and romantic history, beginning in 1535, when Jacques Cartier entered the St. Lawrence. Its settlement dates from 1608, when Champlain founded the city of Quebec. For more than a century and a half the Province remained under the dominion of France, and was known as New France. England finally obtained possession of it by the victory of Wolfe over Montcalm on the Plains of Abraham, in 1759.

At times the existence of this "nation within a nation" has led to serious difficulties. In 1837 there was a short-lived rebellion of French-Canadian peasants under the leadership of Louis Papineau. The rebellion failed, but it led in 1841 to the establishment of a united Canadian parliament for the provinces of Quebec and Ontario, or, as they were then known, Upper

QUEBEC

and Lower Canada. This arrangement continued until 1867, when the present Dominion of Canada was formed.

Now let us take a glance at the provincial capital. Few cities of the New World can vie in romantic charm with Quebec. As the traveller approaches on the bosom of the majestic St. Lawrence, he first sees the frowning mass of Cape Diamond upreared against the sky. Long dark lines ridging the summit, 333 feet above the river, betray the position of the massive fortifications of its citadel.

The city is built in two districts—an Upper Town, separated by massive walls about half way up the bluff and the quaint old Lower Town with straggling streets fringing the water front on a narrow strip below. The city walls (Quebec is the only walled city in America) and the old buildings and cobbled streets of the Lower Town make it look like a city of medieval France. The resemblance is heightened when one enters the city for nine tenths of the inhabitants are of French origin, and French is the language of everyday life.

Wherever you turn you see nuns and priests in the costumes of two centuries ago, and the pupils of the seminary still wear the long blue coat piped with white, with green sashes. The picturesque horse-drawn *calèche* or light carriage, and the sleigh in winter, have not entirely given way to the motor car, and the *habitants*, or French Canadian peasants, who throng the markets still live and dress much as did their forefathers.

The Upper Town contains the more fashionable shops, residences, parks, churches, and fine public buildings. Conspicuous among the latter are the buildings of the Provincial Parliament and the various government departments. For 150 years of French rule, and upwards of 30 of British dominion, the city was the capital of Canada, as well as of the Province.

On the heights are the enormous Chateau Frontenac, now a hotel, the seminary of Quebec,

and Laval University, the seat of French learning and culture in the New World. Some of the seminary buildings date from the latter half of the 17th century. Many splendid old churches and convents, famous for their paintings and relics, remind the visitor of the religious zeal which played so large a part in winning the New World for civilization. The Basilica or French Cathedral, dedicated in 1650, is one of the oldest places of worship in the Dominion.

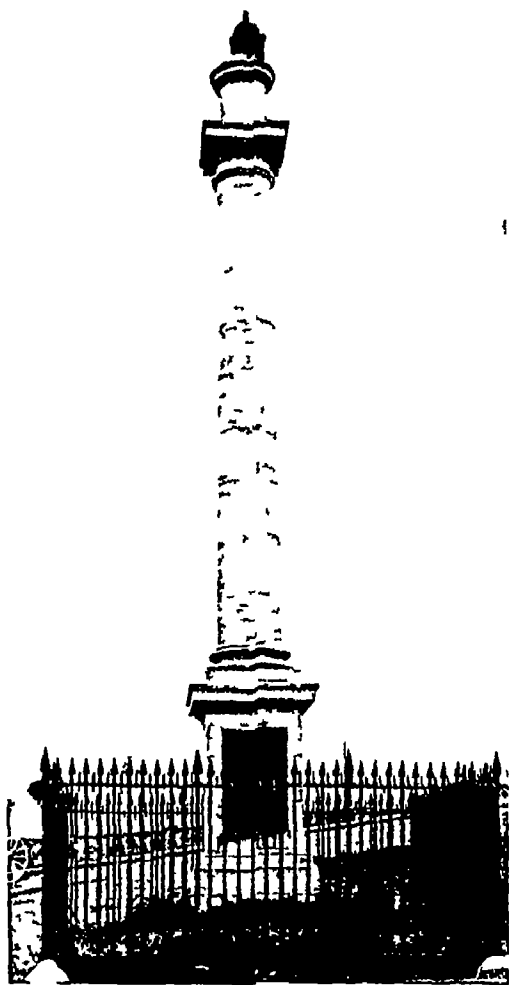
In the nave of the Ursuline Convent chapel (1639) lie the bones of Montcalm.

Along the banks of the St. Lawrence (spanned here by the mighty Harbour Bridge) and its tributary, the St. Charles, are miles of wharves and docks, for Quebec was long the chief port of Canada. It is not now the commercial centre that it once was, however, for the western development of the country transferred most of the export trade of the province to Montreal. On the other hand, as the ocean-going vessels increase in size, it has become more difficult for them to ascend the river to reach Montreal, for at Quebec it narrows considerably. This is bringing some of the commerce, especially in lumber, back to Quebec.

One of the historic spots visited by every traveller is the Plains of Abraham, where a monument commemorates the heroic Wolfe, who fell in the hour of England's victory. There is to be seen in the Governor's Garden a common monument to both Wolfe and the French commander Montcalm.

The population of the city is 130,000.

Queensland, AUSTRALIA The entire north eastern portion of the great continent of Australia is included in this State. The population is extremely scanty, only slightly more than one person for every square mile. Only about one acre out of 400 is under cultivation, though maize, wheat, and sugar cane are all important crops. Gold, tin, coal, and other minerals are extensively mined, and considerable

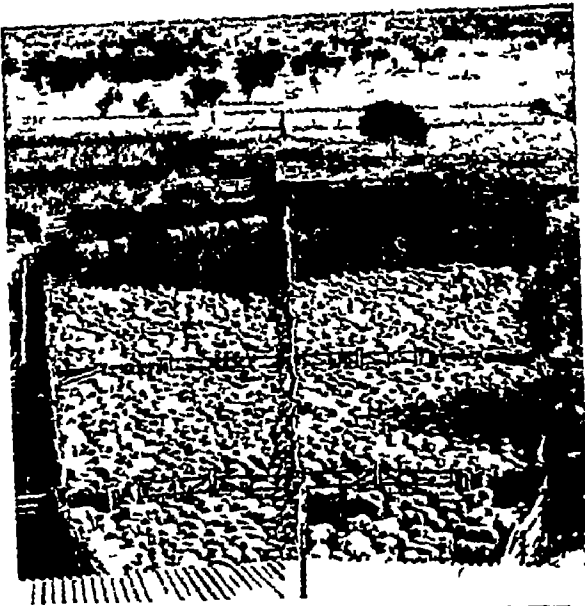


QUEBEC'S MEMORIAL TO WOLFE

On the world-renowned Plains of Abraham, where, in 1759, was fought one of the great decisive battles of history, stands this column erected to the memory of the gallant English general James Wolfe. Three times wounded, he died in the hour of victory, and this column marks the spot where he fell. It is inscribed "Here died Wolfe, victorious."

Canadian Pacific Railway

PRODUCTS OF QUEENSLAND'S RURAL INDUSTRIES



A large proportion of the total area of Queensland is leased in squatting runs for pastoral purposes, and the upper left-hand photograph shows a sheep station on Isis Downs Isisford. On the right are sugar-canes at South Johnstone, Innisfail. These are only ten month plants, but look at the height they have reached already ! Queensland has a number of fine natural forests and the timber trade is very valuable , forest reservations cover nearly six million acres In the lower photograph we see timber being hauled across a ford on its way to the mill at Lamington, in the Beaudesert district.

Photos by courtesy of Agent-General for Queensland

quantities of timber are cut from the immense forests which cover so much of the State, but lack of labour has prevented the adequate development of these abundant resources. Eucalyptus, cedar and pine are the trees that supply the greater part of the cut wood, but other varieties are also used for making furniture.

More than half of Queensland lies within the tropics. The winter, which is practically rainless, is about as warm as an English summer. The summer, when the heavy rains occur, is considerably warmer, but extremes

of temperature are practically unknown. Most of the northern coast-land is tropical forest, with luxuriant palms, tree ferns, bamboo, and screw-pine. The eastern coast, off which is that marvel of coral, the Great Barrier Reef, is wonderfully picturesque, for the mountains come right down to the sea.

Pine apples, bananas, and many other tropical fruits are raised. Farther inland, where rainfall is scanty, are the grassy lands with their famous sheep walks and cattle runs. More than a third of the cattle in Australia are in Queensland, and the dairying industry is rapidly growing. Manufactures are still of comparatively little importance, but metal founding, tanning, sugar and flour milling, and distilling engage a certain amount of attention.

Brisbane (qv), the capital, is the only city of any considerable size. It is an important shipping and air transport centre.

The history of Queensland as a British territory dates from 1825, when a branch penal settlement was established at Moreton Bay. Two years later squatters moved beyond the Dividing Range to the Darling Downs, and so opened up a rich agricultural district. These farmers had very little intercourse with the settlement

on the coast, but were more in touch with Sydney to the south. And ever since that time there has been a difference in outlook and manner of life between the farmers in the dry uplands inland and the planters in the

semi-tropical regions by the sea. In 1859 Queensland was constituted a separate colony. The population was then about 20,000, but had grown to 500,000 even by the end of the century, and today is nearly a million.

The Government of Queensland is unique among the states of Australia in that there is now only one House of Parliament—a Legislative Assembly of 62 members. The Governor is assisted by an Executive Council of Ministers.

Quince and Medlar. In the old orchards that are so often found near English country houses and farms, you may often see these two trees, as likely as not neglected and running almost wild, bearing but little fruit, and noticeable because of their rather unusual appearance.

The quince (*Cydonia vulgaris*) when left to itself often becomes a mere bush, straggling over a large area and hardly producing fruit at all. Its stems become spiny, too, and it seems

most unlike a fruit tree. In summer you may recognize it by the white, woolly down which covers the young leaves and the undersides of the older ones. The flowers, like those of the apple though much larger, are single or in pairs, and they give place to pear-shaped fruits, which turn a yellow colour and which are covered with white down. Quince jelly is a considerable delicacy, and, though made but little in Britain, it reaches us in large quantities from Australia in tinned form.

Area—Estimated at 670,000 square miles including adjacent islands. **Population**, 947,500. **Physical Features**—In the east highlands and plateaux in the west and interior flat plains and lowlands. **Principal Products**—Wool, timber, plywood, maize, wheat and other crops, coal, gold and other minerals, meat, dairy produce. **Chief Towns**—Brisbane, capital (318,000). Rockhampton (30,000). Townsville. Toowoomba.



STRANGE FRUITS OF QUINCE AND MEDLAR

Here are some curious fruits, those on the left, which look so like hairy pears, are quinces, and when ripe they will have lost some of that hair, becoming a warm yellow colour. Quinces are chiefly used for jam and jelly. The medlars, which look like apples that have somehow "gone wrong," are a rich red-brown colour. To eat them you have to wait until they are almost rotten.

U. Bastin



HOW QUININE IS OBTAINED FROM THE BARK OF A TREE

From Java comes much of our supply of quinine, and here you see natives drying quinine bark on a cinchona plantation on Tyuremai Mountain, West Java. The cinchona tree is of value solely on account of its bark, from which quinine is obtained. The bark is mixed with milk of lime and then treated with boiling alcohol. Quinine is a most valuable medicine in cases of fever and is widely used in combating malaria. It is also used to stimulate the salivary and gastric secretions in indigestion.

Courtesy of the Netherlands Information Bureau

The medlar (*Mespilus germanica*) is usually rather more of a tree than the quince, though it resembles it in that it is always more or less twisted and straggling, with a contorted, rough barked bole and irregular branching. Its flowers are smaller than those of the quince. The leaves are long, narrow, parallel sided and dark green in colour, and the fruit is a strange brown object, like a small, rather flattened apple with a depression in the top. Round the edge of this depression you can see the remains of the five sepals. These fruits are not eaten when ripe, but are allowed to get over-ripe—to "blet," as the term is—until they are soft and acid juices have disintegrated. Then they may be eaten raw, or used as a flavouring, or for making jam or jelly.

Quinine. (Pron kwī nēn') In 1638 the Countess of Chinchon, wife of the Governor of Peru, lay grievously ill with fever. She was cured by means of a native Indian remedy, prepared from the bark of a certain kind of tree, which from her name we now know as "cinchona"; the botanical name is *Cinchona officinalis*. The knowledge of the curative properties of its bark was gradually spread throughout Europe, largely by Jesuit missionaries.

By quinine we usually mean the sulphate of quinine. This is obtained by treating the powdered bark with lime, then alcohol, and neutralizing it with sulphuric acid. Other chemical salts of quinine are hydrochloride and hydrobromide of quinine, the first being produced by the use of hydrochloric and the second by hydrobromic acid.

The bark of several species of cinchona trees is used to make quinine. In their wild state they grow either singly or in small clumps in the dense forests of South America, and collecting the bark, which is done by the Indians, was formerly a work of difficulty and danger. To increase the supply of bark and prevent the disappearance of the tree, cultivated cinchona plantations have been established in Java and elsewhere, and it is from Java that most of our quinine now comes.

Quintain. If you had visited an English village some time in the Middle Ages you might have seen set in the middle of the green, an erection called the quintain. This was an upright post, sometimes in the shape of a man, turning on a pivot and bearing an outstretched arm, which as a general rule carried a bag filled with sand.

QUINTAIN

A knight practising for tournament would tilt with his lance at the outstretched arm, and if he missed the mark he stood a good chance of being hit on the back and perhaps being unseated from his horse by the sand-bag

This sport was popular at country weddings till about two hundred years ago, and something of the same kind may be seen in present day military 'sports' The word "quintain" comes from the Latin *quintana*, the street between the fifth and sixth maniples of a Roman camp—where the soldiers exercised themselves

Quoits. (Pron koits) The ancient game of quoits, which may still be seen in certain country districts of England and Scotland, is played with a flat backed ring of iron, weighing about 9 lb

Two iron pins or "hobs" are set up, one at each end of the playing area, rising an inch above the surface of a clay bed. The object of the game is to throw the quoit so that it will fall over one of the pins and at the



LAST SURVIVING QUINTAIN

Offham, a village near Maidstone, in Kent, has the only quintain still remaining in England. Here is a photograph of it. Quintains, originally used for practising the knightly art of tilting with the lance, survived in country games down to the 18th century

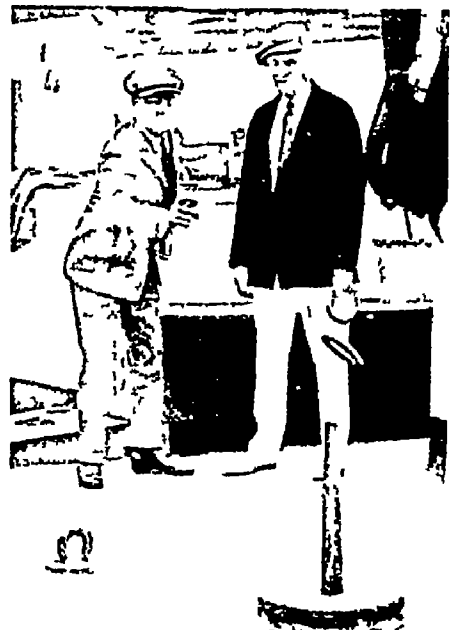
Photo H. Felton

same time bite into the clay. A quoit that falls over the pin is known as a "ringer," and normally counts two points. If his quoit lands nearer the pin than his opponent's, a player scores one point, and two if both his quoits are nearer. All quoits which alight on their backs are "foul"

Two of the most popular of all games played on board ship are deck quoits and deck tennis. In the former, four rope or rubber quoits are thrown either at a wooden peg 18 inches high or on to a "target" of three concentric numbered circles, from a distance of about 15 feet.

Deck tennis resembles lawn tennis in that each player attempts to return the quoit over the net. It must be caught with one hand, and the return must be made from the point where the quoit was

caught. Overarm or "flat" throws are forbidden, but the service may be either forehand or backhand. The scoring is either as for badminton or as for lawn tennis.



PLAYING QUOITS ON LAND AND AT SEA

The ancient game of quoits still has its devotees. Here, on the left, is a scene from the final of an All England Individual Quoits Championship, held in London. The judges are using callipers to measure the distance of the quoits from the pin. On the right a quiet game of deck quoits is in progress on board ship. Deck quoits is a favourite pastime on ocean cruises.



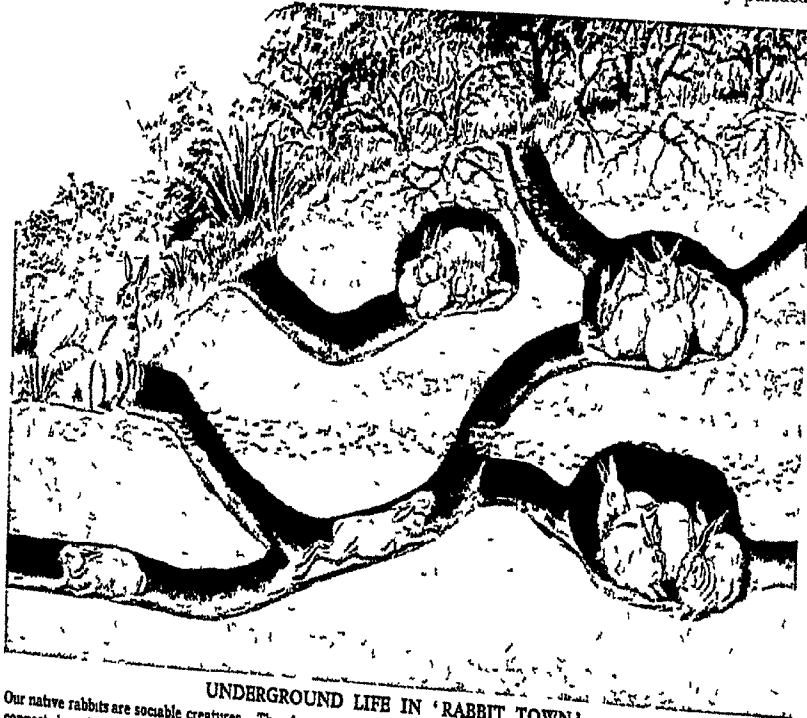
OUR letter R is generally traced back to the old Egyptian hieroglyph representing a mouth. Written in a running hand (the so called hieratic form) it became *ꜥ*. The Phoenicians, writing on stone, gave it a more angular form *𐤓* and called it *Resh*, meaning "head," from its fancied resemblance to the head supported by the neck. The Greeks turned it round and then later rounded it so that it looked just like our P. We should have had two letters with exactly the same form had they not added a little tail, which made the letter R as we have it today. The Romans kept this form, but the Greeks who had developed the form *Ϝ* for P dropped the tail again, so their R (*Rho*) is still written *Ρ*. No other consonant shows so many variations in pronunciation as the sound *r*. In France and Germany it is rolled. In England and North America it varies greatly according to the locality. Of the close relationship between *l* and *r* we have already spoken in the story of L.

Rabbits AND HARES Do you know the difference between a hare and a rabbit? If you do, you know more about these animals than a great many people. Wild rabbits are smaller and have shorter ears and shorter hind-legs than hares. They live and breed in burrows, and their young are born blind and nearly naked. Hares do not burrow, and their young, which are born in a hollow in the grass, called a "form," are covered with fur at birth and have their eyes open. The hind legs of hares are longer than their fore-legs, this enables them to run faster up hill than down.

Hares and rabbits are rodents, or gnawing animals, but, unlike most members of this group, they possess two small incisors, or cutting teeth, behind the large ones in the upper jaw.

Their upper lips are cleft, and that is why a deformity of the upper lip in human beings is called "hare-lip." Their tails are short and stand erect, showing from the back a white "scut." They have five toes on the fore-feet, and four on the hind-feet. They are mostly nocturnal in their habits, that is, they usually remain "at home" during the day, and go out to feed in early evening or at night. They feed upon vegetable matter, from grass, buds, berries, and the bark of trees and shrubs to clover, cabbage, dandelion leaves, and carrots. Though timid, these creatures fight bravely in defence of their young, and in self-defence, and can strike powerful blows with their hind-feet.

In avoiding their enemies they display considerable cleverness, and when closely pursued



UNDERGROUND LIFE IN 'RABBIT TOWN'

Our native rabbits are sociable creatures. They form colonies in burrows called 'warrens.' Most of the numerous passages are connected with little side "pockets" in which individual families dwell. Mother rabbits, however, usually have separate burrows, as you see in the upper part of the picture, where they live until the little ones are well grown. The main warren always has two or more entrances, so that if enemies such as weasels and ferrets come in at one door, the inhabitants can run out through another. As you see in this drawing, the entrances are made behind the concealing protection of a bush or rock.

RABBITS

they have a habit of stopping suddenly almost under the feet of their enemy, then turning with remarkable swiftness to run in another direction.

Their tremendous speed is due to their peculiar method of running, to which the structure of their legs is well fitted. When the hare or rabbit takes to flight he leaves the ground with a tremendous leap, and for an instant is completely extended. While in the air, however, he brings his hind legs forward until they project beyond and above his head.

While bunched in this position, his fore paws strike the ground, one ahead of the other. His momentum tilts him forward, and at the same time he starts swinging his hind legs downward. They strike the



John H. Vickers

ALERT, WITH EARS ERECT

When their suspicions are aroused rabbits will sit at the mouths of their burrows, ready to disappear into the friendly shelter at the first signs of danger. This particular rabbit is a young one, as you can tell by the relative shortness of its ears, but already it has a wary look.

last its pursuers in the open.

By Man these animals are persistently hunted for their flesh, and fur (used for hats). In addition

ground side by side, but at a spot far ahead of where the front feet are planted. Doubled up thus like a spring, the rabbit "uncoils" suddenly in his next leap.

This method of running is the cause of the peculiar appearance of rabbit tracks, familiar to all who visit the country in winter. Measurement of these tracks shows that a frightened rabbit covers many feet at a single bound. An interesting point is that, for all the hare's famed speed, it is not actually so fast as the rabbit over short distances. For the "bunny" needs violent speed only to reach its burrow, while the hare must out-



AMERICAN RABBITS MAKE NESTS WITH THEIR OWN FUR

The photographer has pushed the long grass aside to make a picture for us of a nestful of young cotton-tail rabbits. See how quiet and trustful they are. They need to be well hidden to escape their many enemies. The mother rabbit has hollowed out this spot in thick undergrowth and has lined it with fur taken from her own body. If you came close to the nest without knowing where it was, you would not hear a sound of stirring or a single squeal, no matter how hungry the little ones might be. For they know by instinct that a noise would perhaps attract a passing coyote or mink, or weasel!

RABBITS



BROWN HARE BROWSING

You can tell the brown hare from the rabbit by its greater size and also by the greater length of its ears and hind limbs. This one is feeding peacefully quite unaware that he is being snapped by the camera.

to Man all the beasts and birds of prey are their natural enemies. They are the constant food of foxes, cats, stoats and weasels, owls and hawks. Despite all their foes they increase so rapidly that they sometimes overrun large areas and destroy entire crops. In 1870 three pairs of European rabbits were turned loose in Australia and within a few years it became a question whether their descendants could be controlled before they swept the country clean. Large sums of money were spent on bounties and for devices for killing the rabbits or protecting the crops. Many professional rabbiters are employed to exterminate them (See Australia). New Zealand had a similar experience a few years later, and in both these countries rabbits are now a permanent pest. Even in England the decline in farming has led to a terrible increase in them, and every year rabbits cost us more and more in indirect damage to the land. Gassing, trapping, and shooting all fail to keep them down, and there are those who see in the rabbit problem already a matter of prime national importance.

Hares and rabbits belong to a single genus *Lepus*. The common hare (*L. europaeus*) is found in all parts of Europe (except Ireland, Scandinavia and northern Russia), in Ireland a distinct species (*L. hibernicus*) is found. In mountainous districts and in northern Europe generally the blue or mountain hare (*L. timidus*) takes the place of the others. It is smaller and in winter its coat turns white.

The European rabbit lives in colonies in burrows called warrens. It feeds in the early morning and late evening, and remains in its burrow during the day. This is the species that was introduced into Australia and New Zealand and overran those countries. It is also the ancestor of most of the domestic varieties.

Different kinds of Rabbits

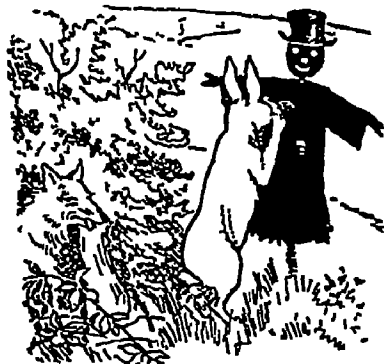
All the domestic varieties, including the Belgian hare, are rabbits. The Belgian rabbit weighs about 10 lb. The Patagonian is by far the largest, weighing from 12 to 16 lb. The lop-eared rabbit is larger than the Belgian and is remarkable for its ears, which lop, or hang down, and are from 10 to 12 inches long and 6 inches wide. The Angora is noted for its long silky fur. Other domestic breeds are the Polish, Flemish, Himalayan, Dutch, Siberian and silver tip. Snow white rabbits with pink eyes—albinoes—are favourite pets. They are pretty easily kept, and become very fond of their owners. Of recent years skilled breeding has evolved many new rabbit furs for use in imitation of every other type of fur. The six furs are called *conys* in the fur trade.



LITTER OF LEVERETS—YOUNG HARES

Baby hares or leverets—the little creatures you see above—are born with their eyes open and already fully covered with fur. This is because they live in the open with very little protection, and must always be ready to run or hide at their mother's command. As with rabbits their mother is known as a doe and their father as a buck.

The Story of Brer Rabbit



IN the days when the negroes were still slaves in America, the little darkies used to laugh until they cried over the adventures of Old Brer (Brother) Rabbit. One of the most amusing of these stories tells us that one day Brer Fox went to work and got some tar, and mixed it with turpentine, and fixed up a contraption which he called a Tar-Baby (a sort of guy). The story continues. He took this Tar-Baby and set her in the big road, and then he lay off in the bushes to see what was going to happen. And he didn't have to wait long, because by and by here comes Brer Rabbit pacing down the road, *lippy clippity, clip pitty lippy*. Brer Fox, he lay low. Brer Rabbit came prancing along till he spied the Tar-Baby, and then he fetched up on his behind legs, like he were astonished. The Tar-Baby she sat there, and Brer Fox he lay low.

"Morning!" says Brer Rabbit. "Nice weather this morning," says he.

Tar-Baby ain't saying nothing, and Brer Fox he lay low.

"How d'ye do?" says Brer Rabbit, says he.

Brer Fox he winked his eye slowly, and lay low, and Tar-Baby she ain't saying nothing.

"How're you getting on, then? Is you deaf?" says Brer Rabbit. "because if you is, I can holler louder," says he. Tar-Baby stay still, and Brer Fox he lay low.

"You're stuck up, that's

what you is," says Brer Rabbit. "and I'm going to cure you, that's what I'm going to do," says he. Brer Fox he sort of chuckle in his inside, but Tar-Baby ain't saying nothing.

"I'm a going to learn you how to talk to respectable folks, if it's the last act," says Brer Rabbit. "If you don't take off that hat, and say 'How d'ye do?'" I'm going to bust you wide open," says he.

Tar-Baby stay still, and Brer Fox he lay low.

Brer Rabbit kept on aying her, and the Tar-Baby she kept on saying nothing, till presently Brer Rabbit drew back with his fist, and *blip!* he took her on the side of the head. His fist stuck, and he couldn't pull loose. The tar held him.

"If you don't let me loose, I'll knock you again," says Brer Rabbit. and with that he fetched her a wip with the other hand, and *that* stuck.

Tar-Baby she ain't saying nothing, and Brer Fox he lay low.

"Turn me loose, or I'll kick the stuffing out of you," says Brer Rabbit, says he, but the Tar-Baby she ain't saying nothing. She just held on, and then Brer Rabbit lost the use of his feet in the same way. Brer Fox he lay low. Then Brer Rabbit butted, and his head got stuck.

Then Brer Fox he sauntered forth, looking as innocent as could be. "How d'ye do, Brer Rabbit?" says Brer Fox. "You look sort of stuck up



and the Silent 'Tar-Baby'

this morning," says he, and then he rolled on the ground, and laughed till he could laugh no more

By and-by he up and said "Well, I 'spects I've got you this time, Brer Rabbit, may be I ain't, but I 'spects I is. You've been cutting your capers and bouncing round in this neighbourhood until you've come to believe yourself the boss of the whole gang. And then you're always somewhere where you've got no business," says Brer Fox, says he. "Who axed you to come and strike up an acquaintance with this here Tar-Baby? And who stuck you up there where you is? Nobody in the round world. You just took and jammed yourself on to that Tar-Baby without waiting for any invitation," says Brer Fox, "and there you is, and there you'll stay till I fixes a pile of brushwood and fires it up, because I'm going to cook you this day," says Brer Fox, says he.

Brer Rabbit began to talk mighty humble. "I don't care what you do with me, Brer Fox," says he, "as long as you don't fling me into that briar-patch. Roast me, Brer Fox," says he, "but *don't* fling me into that briar patch!"

"It's so much trouble to kindle a fire," says Brer Fox, "that I 'spects I'll have to hang you."

"Hang me as high as you please, Brer Fox," says Brer Rabbit, "but for goodness

sake don't fling me into that briar-patch," says he.

"I ain't got no string," says Brer Fox, "and now I 'spects I'll have to drown you," says he.

"Drown me as deep as you please, Brer Fox," says Brer Rabbit, says he, "but don't, *don't* fling me into that briar-patch!"

"There ain't no water nigh," says Brer Fox, "and now I 'spects I'll have to skin you," says he.

"Skin me, Brer Fox," says Brer Rabbit. "Snatch out my eyeballs, tear out my ears by the roots, and cut off my legs," says he, "but *please*, Brer Fox, *don't* fling me into that briar patch!"

Of course Brer Fox wanted to hurt Brer Rabbit as much as he could, so he cotted him by the behind legs, and slung him right in the middle of the briar patch. There was a considerable flutter where Brer Rabbit struck the bushes, and Brer Fox sort of hung round to see what was going to happen. By and by he heard some one call him, and away up the hill he saw Brer Rabbit sitting crosslegged on a log, combing the tar out of his hair with a chip. Then Brer Fox knew he had been done mighty bad.—*Retold (by permission of Messrs Ernest Benn, Ltd) from "The Wonderful Adventures of Old Brer Rabbit," told by Uncle Remus (Joel Chandler Harris) Drawings by Le Fanu*



Rabelais, FRANÇOIS (Pron rab' e lā) (c 1490–c 1553) The hearty, glib, raucy laughter of this famous French humorist rings in our ears even now, down four centuries of time. While pretending to tell a fairy tale about the adventures of two giants, Gargantua and Pantagruel, Rabelais makes huge fun of the vices and foolishness of the people about him, and of abuses within the Church. His humour is at times so shocking, and his stabs at the Church so deep, that it is hard to believe that he was almost all his life a member of the clergy.

Rabelais became a brother of the order of St Francis in the convent of Fontenay-le-Comte in western France about 1519, and pored over so many great volumes and learned so many strange languages that the other monks began to fear and suspect the young wiseacre. They charged him with heresy, and in wrath he whisked his monk's robes out of the door and down the dusty highway, which led him on a long vagabondage. Though he still wore his pious costume and retained it all his life, we next find him at Montpellier, in the south, studying medicine, lecturing in the university there, and, in 1530, becoming physician of the hospital. And it seems doubtful if the Church would any longer have influenced more than his costume, if he had not about this time won the friendship of Jean du Bellay, who was later made a cardinal.

When Bellay went to Rome in 1534, Rabelais was a member of his retinue, the Pope's pardon was granted him for his abrupt departure from the monastery, and later, also through the good offices of Bellay, he was given livings in the Church of France which lifted him above the fear of want. During a period of religious persecution in 1547 he fled to Metz, and as physician gained a humble fame among the poor.

In 1552 he published his fourth book about Pantagruel, resigned his living and went to Paris, where he died not long afterwards murmuring, "I go to find the great Perhaps."

The precise year of Rabelais' birth is not known. In his half vagabond life he made the acquaintance of every tramp and trudging workman along the road, of the great men of the Church, and of the king and his court. From such a life was distilled the wide sympathy with all men, and the rowdiness, the cleverness, the liveliness which make his writings still read today.

Rabelais lives in history because of his huge, rambling series of chronicles narrating the adventures of his mythical giants, Gargantua and Pantagruel. The first part of the chronicles

appeared in 1533, but the complete edition was not published until after his death in 1567.

Raccoon. This is one of the characteristic animals of North America, where, as the "coon," it figures in many folktales and old stories. It is a relative of the bear, though it is much smaller and does not greatly resemble the bear except in its manner of walking, which is "plantigrade"—that is, with the hind feet resting flat on the ground.

The common "coon" (*Procyon lotor*) of the United States has a stout clumsy body, about two feet long. The long coarse hair of the body is greyish-brown, and the long tail is ringed with black and white. The head is broad with a pointed muzzle, and the face is crossed by a dark band which includes the eyes.

The raccoon spends the day at home, high up in the hollow of a large tree, here it rests by day and sleeps through the severe winter weather. It is active at night, and is very destructive to young crops. Besides maize, its usual foods are fish, crayfish, and various molluscs, though it also eats mice, insects, fruits, small birds, and eggs. The raccoon makes an interesting pet, for it is intelligent and full of a restless curiosity.

In early pioneer days raccoon fur was much used for coats, carriage robes, and especially the famous "coon skin" caps, on which the tails were often left hanging. A species called the crab eating raccoon is also found in parts of South America.



RABELAIS—LAUGHING HUMANIST

François Rabelais was a virile satirist of the abuses of his time, but he was a good-natured reformer, and there was no malignity in his robust writings. He had confidence in life and loved every aspect of it.

Painting in Versailles Museum photo (London)

BLACKFACE MEETS HIS NEIGHBOURS

The Story of a Young Raccoon

Bright black
eyes saw
everything



BLACKFACE was a little raccoon, and he lived in a hollow high up in a big tree. He had four little brothers and sisters. They lived in the hollow tree, too, and so did his father and mother.

The little raccoons looked just alike. Their faces were black and their noses were sharp. They had bright black eyes that saw everything that was going on around them. All of them had fine coats of grey fur and beautiful bushy tails with black rings around them right to the very end.

Blackface was the liveliest in the family. He was full of mischief, and he liked to romp and play better than anything in the world. He was very curious, too, and he sometimes let his curiosity get him into trouble.

"Dear, dear!" his mother would often say. "I don't know what I am going to do with you, Blackface, if you don't learn not to meddle with things you do not understand. Ask all the questions you like, but don't be nosing and touching everything that comes along." This was very hard for Blackface to learn. Every time he saw anything new he always wanted to touch it or grab it with his slender little paw to find out what it was.

Another thing that was hard for him to learn was to sleep all day. His brothers and sisters lay on the floor of the den and slept the whole day through as their mother and father did, but Blackface was too lively for that. He liked to poke his little head out at the doornay and see what was going on in the forest. Most of all, he liked to climb down the tree and play about on the ground, though he did not do this very often because his father and mother would not let him.

"I don't see why we have to sleep in the daytime, when all the other creatures are awake," he said to his father one day. "Why do we, father?"

"It is a thing raccoons have always done," his father told him. "We stay in our dens in the daytime to rest and sleep. At night we go out and hunt for our food. It is much the safest way."

Blackface didn't say anything more, but he still thought it was silly to sleep in the daytime when there was so much to see and do. He made up his mind that he would stay awake, no matter what other raccoons did.

RACCOON

So one summer afternoon, when his father and mother and brothers and sisters were fast asleep, Blackface very quietly slipped out of the den. For a moment he stood on a big branch, just outside the doorway, and looked about him. Then he started down the tree.

He went down head-first, as all raccoons do, digging his little sharp claws into the bark to keep from falling. Pretty soon he reached the ground.

"Now," he thought, "I will go wherever I like, and do whatever I please. This is a lot more fun than sleeping."

He started off through the woods. He hadn't gone far, when he heard a queer noise up in a tree. *Tap—tap—tap, tap—tap—tap*. Blackface looked up. He saw a bird tapping its long bill against a tree as hard as it could.

"I wonder why he's doing that," he thought. "I'd better try to find out." So he started up the tree.

The woodpecker was getting his dinner. He was very much annoyed at being interrupted and flew away with a loud scream. Blackface continued climbing. "Maybe he will come back," he thought. "I'll just wait, because I *must* find out why he tapped like that."

Soon the woodpecker came back and flew very near to the little raccoon. "What are you doing in my tree?" he asked angrily. "Go away this minute!"

Blackface was surprised, but he was not frightened. He answered, "I just came up here to find out why you tapped on the tree like that."

"Go away! go away! I tell you!" the woodpecker screamed louder than ever. "Go away, or I will peck you with my bill!"

"I won't go away," Blackface said stubbornly, "until I have found out what I want to know!"

The woodpecker darted at him and pecked him on the head!

"Ouch!" cried Blackface. "That hurt!"

"Of course it did!" screamed the woodpecker, "and if you don't go away I will peck you again!"

Once more it darted toward him, and this time Blackface didn't wait a second. He turned and scrambled down the tree as fast as he could go.

"Dear me!" he said when he was on the ground once more, "what a cross old bird! And I didn't find out what I wanted to know, after all!"

He wandered on through the woods and soon forgot about the woodpecker, because there were so many other things to see. All kinds of creatures scampered about—up and down trees and through the grass—but none of them paid any attention to the little raccoon.

"I do wish someone would talk to me," he thought, "but every one seems to be too busy."



So he
started
up the tree

RACCOON

Just then a black beetle came running along the path where Blackface was standing. Blackface had never seen such a queer looking thing, and without thinking he reached out to touch it. Quick as a flash, the beetle fastened its pinchers in the little raccoon's paw and pinched it sharply!

"Oh! Oh! Oh!" cried Blackface, shaking his paw. "Let go! You're hurting me! Please let go!"

The black beetle opened his pinchers and dropped to the ground. "There! I hope that will teach you not to meddle with me another time!" he said as he scurried away.

"Oh, dear me!" Blackface thought as he licked his paw. "Everyone in the woods seems cross. But surely if I walk far enough, I'll find *someone* who will talk to me." So he kept on walking.

At last he came to an open place where bright-coloured flowers bloomed in the tall grass. "Isn't this pleasant?" Blackface thought. "I'm glad I found this place."

The sun was getting low in the sky now, and the little raccoon lay down in the grass to rest. His head was sore where the woodpecker had pecked it, his paw was sore where the beetle had pinched it, and he was tired and sleepy after his long walk.

He hadn't been lying there very long when something said *buzz—buzz—buzz*, close to his ear. Blackface turned quickly. He couldn't see anything except a little creature with wings, sitting on a flower.



The bumblebee
darted at
his nose



"That will
teach you," said
the black beetle

"Was it this little fellow who made all the racket?" he wondered. Forgetting about the woodpecker and the beetle, Blackface put out his paw to touch the little creature.

Zoom! The bumblebee darted at his nose and stung it as hard as he could!

"Oh, dear me! Oh, dear me!" cried Blackface, rubbing his nose on the ground. "That hurt! Why did you do that?"

"It's the only way I have to make you stop bothering me," said the bumblebee. "Haven't you learned not to annoy others?"

"But I only wanted to find out about you," answered Blackface, unhappily.

"Well, you found out that I can sting, didn't you?" the bumblebee said. "And now I must hurry and gather all the honey I can before it is dark."

Blackface was very uncomfortable. His head was still sore where the woodpecker had pecked him. His paw was still sore where the beetle had pinched him. His nose was still sore where the bumblebee had stung him. He wanted his mother.

Blackface shut his eyes. The sky grew dark.

"Blackface! Blackface! Blackface!" he heard. Blackface jumped up. There stood his mother! "Blackface," she said, "I have been looking everywhere for you! Where in the world have you been?"

"I have been walking through the woods to see

RACCOON

what I could see," Blackface said, trying to be brave

"Well, it was very wrong of you to run away when you should have been asleep in the den. Something might have happened to you."

"Something *did* happen to me," Blackface answered quickly. And then he told his mother all about the woodpecker and the beetle and the bumblebee. And when he had finished telling her, he whimpered a little and said, "I'm awfully hungry, too, mother."

His mother did not scold him any more. She only rubbed his fur with her nose and said, "You will feel better when you have something to eat. We will go down to the stream and fish for our supper. Your father and the rest of the family are already down there."

Blackface followed his mother down to the little stream. "Hello, Blackface!" called his sister Grey-paws. "Come and fish with us—we're catching crawfish."

The cool water felt very good as he waded out into it. He began to feel about on the sandy bottom of the stream with the slim fingers of his forepaws. He turned over several stones before he found what he wanted, but by and by he caught a fine crawfish.

He was so hungry that he put it to his mouth at once, but his mother called sharply. "Blackface! Don't eat your food until you have washed it! I have told you that a great many times."

"But I am so hungry, mother," the little raccoon told her. "Must I wash all the food I eat tonight?"

"Yes," answered his mother. "Raccoons always wash their food when they can, so of course you must do it too."

Blackface grumbled a little, but he dabbled the crawfish about in the water for a moment or two, and then going out on the shore, he sat down and ate it greedily.

All night long the raccoon family fished and gathered berries and dug up tender roots. At last it was time for them to go back to the hollow tree.

Blackface felt very sleepy. As he trotted along through the woods behind his mother he said,

"I thought it would be fun to go out into the forest in the daytime, but it wasn't as much fun as I thought it would be."

"No," his mother answered. "The safest place for raccoons in the daytime is inside their hollow tree."

"After this, I'm going to stay in the tree in the daytime, and sleep as you and father do," he said. "But I will go out at night, won't I? I will go out every night for the rest of my life and fish in the stream for my supper."

"Not *every* night," his mother told him. "You will fish and eat all summer, but when the cold comes, you will go to sleep in the hollow tree, and you will sleep there all winter long."

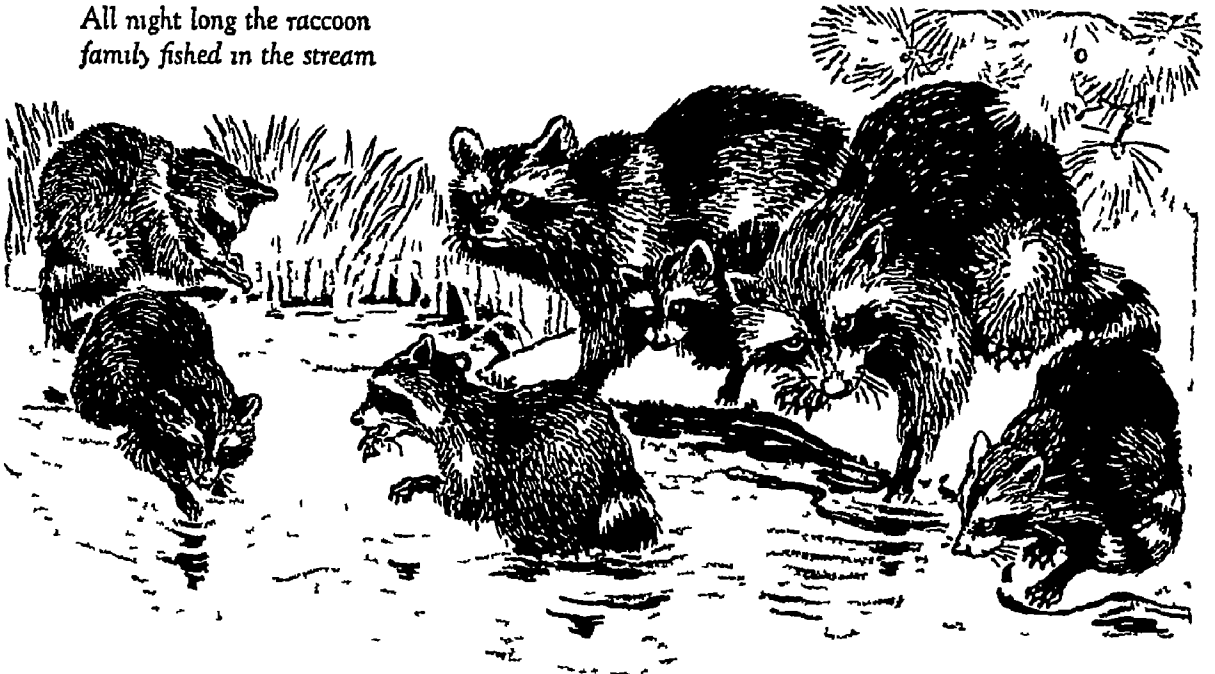
"Won't I fish at all, then?" the little raccoon asked.

"No," his mother answered, "you will only sleep. Raccoons always sleep when winter comes, so you will be safe and snug in the den. You will not wake until the warm spring is here again."

Blackface thought about this for a little while, but he soon forgot it, for winter would not be here for a long time yet.

Safe up in the den once more he thought only about the fun he would have when he went fishing again.

All night long the raccoon family fished in the stream.



Races of Mankind.

The inhabitants of the earth present such a bewildering variety of characteristics that the attempt to classify them into a few main divisions or races is one of great difficulty

Many schemes of classification have been proposed, based on geographical distribution, language, physical characteristics, and habits and customs. Modern ethnology (as this branch of knowledge is called) for the most part bases its classification on physical characteristics, and considers a race as a permanent division of mankind having a common biological inheritance as indicated by the shape of the skull, the "facial angle," the colour of the skin, the form and colour of the hair, the shape of the facial features, the stature and proportions of the bones, etc. The most obvious of these race characteristics, and the one used in grouping mankind into the white, black, red, yellow, and brown races, is the colour of the skin.

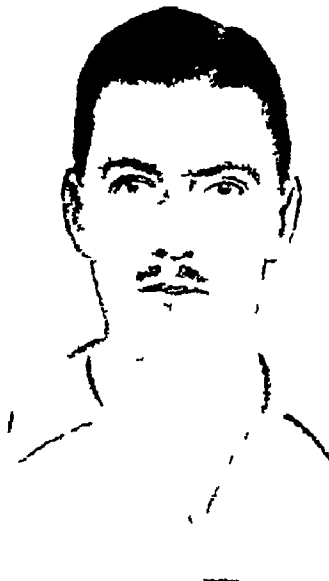
In subdividing these largest groups, however, it becomes necessary to use other physical characteristics as well. Perhaps the most important of these is the shape of the skull, especially with reference to the ratio of its breadth when



TYPES OF FIVE RACES

Here you see representatives of the following races: 1, brown—a Malayan woman; 2, red—American Indian; 3, white—Briton; 4, yellow—Chinese; 5, black—African Zulu.

Photos Dr C Hoxe Smithsonian Institute South African Blys



seen from above, to its length. This ratio, which is known as the "cephalic index," can be roughly determined from the shape taken by a man's hat which has been worn long enough to conform to the shape of the head. Multiply the width across the inside of the hat by 100, and divide by the length, and you have approximately the "cephalic index." If the result is 75 or less, the wearer of the hat is *dolichocephalic* or "long-headed"; if it is between 75 and 83, he is *mesocephalic*, or "medium-headed"; if it is more than 83 he is *brachycephalic*, "short-headed," or "round-headed." This is, however, not an infallible criterion, since the shape of the head may be artificially altered. Thus the Melanesians of New Britain, an island to the east of New Guinea, bind the heads of their children from infancy, and in this way produce peculiar long heads.

Another important characteristic is the facial angle. This term is used for the angle made by the bones of



the face and forehead with the base of the cranium, viewed from the side

On the basis of these and other physical characteristics most leading ethnologists have come to the conclusion that the white peoples of Europe are derived from three primitive races (1) a Mediterranean race, extremely long-headed, rather short and slender, dark haired, and of dark complexion, (2) the Nordic or Teutonic race, also long-headed, very tall, blue-eyed and blonde, (3) the Alpine, broad-headed, of short or medium stature grey eyed, brown haired and of medium dark complexion

The existing peoples of Europe, according to this view, are the result of a mixture of these three types, which are nowhere found in pure racial strains. The "racial purity" which is so deeply stressed by certain European politicians is a myth, without any scientific support. The Scandinavian countries and northern Germany represent the greatest purity of the Nordic or Teutonic stock, the Slavic peoples and the typical stock of Switzerland and central France that of the Alpine stock and the inhabitants of Spain Portugal, southern France, southern Italy, and Greece, that of the Mediterranean

This and similar classifications based entirely on physical characteristics have largely superseded the older classifications based on language

In grouping mankind as a whole, so many classifications have been proposed, varying widely according to the qualities taken as the test, that for most purposes it is convenient to retain the old classification based on geographical distribution and colour of the skin. According to this scheme men fall into five main groups (1) the Caucasian European, or white race, (2) the Ethiopian, African, or black race, (3) the Mongolian, Asiatic, or yellow race, (4) the Malay and Polynesian, or brown race, (5) the American (Amerind) or red race. Often this classification is still further simplified by including the Malay and American races in the Mongolian division.

The hopes entertained by early anthropologists of unravelling the history of mankind by

studying racial features have been abandoned by most students. Even a limited and well-studied area like Africa bristles with unsolved mysteries, and the vast populations of Asia and Europe offer tremendously complex problems. Hence in recent years anthropologists have found it more profitable to study the habits, customs, and beliefs of primitive people rather than their physical characteristics. (See frontispiece)

Racine, JEAN (Pron ras' en) (1639-1699) Although he has been called the greatest dramatic poet of France it may still be disputed whether Racine ranks higher or lower than Corneille, who first shaped French tragedy. Racine's genius at any rate was different—

beautiful, exquisite, poetic and subtle.

Unlike those of Corneille, Racine's characters are well supplied with human frailties, whims, and errors. They are not great heroes, buffeted in a rugged world; they are rather whirled about in the swift current of their own passions. Thus Racine's plays are felt to be more life-like than Corneille's, and the stories deal with what people think and feel and are, rather than with chance adventures through which they pass, no matter how nobly or with great unnatural calamities which drop on them like bolts from the blue.

Racine was born at La Ferté Milon, in what is now the French department of Aisne. He

lost his parents when he was a small boy, and his grandmother then brought him up, sending him to the grammar school at Beauvais, and later to Port Royal, a famous convent school. He spent his boyhood at Port Royal, learning "large tracts of Homer, Sophocles and Euripides," and this period was so happy that when he lay on his deathbed he asked to be buried at Port Royal.

Racine's principal works are "La Thebaïde" (1664), "Alexandre le Grand" (1665), "Andromaque" (1667), "Les Plaideurs" (1668), "Bérénice" (1670), "Bajazet" (1672), "Mithridate" (1673), "Iphigénie" (1674), "Phèdre" (1677). By the French he is regarded as "le classique par excellence."



RACINE—FRANCE'S SOPHOCLES

Jean Racine built his plays on simple themes, and by reason of their truth and insight into human nature they have stood the test of time. The work of this great dramatist possesses the grace and harmony of ancient sculpture. As a classic poet he has been rated by some second only to Virgil.

WONDERFUL WAVES *that* SPAN *all* SPACE

The amazing world that the wave theory opens up is only beginning to be explored, but already astonishing discoveries affecting all life have been made These are recounted here and a table of the known waves given

Radiation. Once the only rays thought of were the visible rays of light. But now it is known that a whole series of other rays exists—some of them much like light in many of their properties, others vastly different, but all called “rays” because they spread outward, or “radiate,” through space in the same manner.

About the middle of the 19th century the brilliant mathematician and physicist, James Clerk Maxwell, set himself to explain the action of electricity and magnetism “at a distance”—that is, the ability of these forces to produce effects across apparently empty space—and to reduce it all to terms of mathematical formulae, so that everything known about the subject could be computed exactly from a few basic assumptions. In 1873 he published his celebrated book, “Electricity and Magnetism,” and the theory advanced in it not only accomplished his purpose concerning these subjects, but could be made to explain how light waves are transmitted through space, for the speed at which electric forces travel through space was found to be the same as the speed of light. All that was needed was to assume that the wave lengths (or distances between pulses) were of the order of a millionth of an inch, which science already believed. If others existed, of lesser frequency and greater length, Clerk Maxwell predicted they would produce electrical effects at a distance, if suitable detecting apparatus were devised. (See Clerk Maxwell, J.)

The Great Guess Proved True

Clerk Maxwell died soon after, but his theory, sometimes called “the most brilliant guess in the history of science,” was triumphantly vindicated between 1886 and 1888 when Heinrich Hertz found the predicted electric effects. From Hertz’s discovery others developed wireless (qv), but science was interested in another result. If electromagnetic pulses of extremely short wave-length gave light, and those with wave lengths of several yards (like Hertz’s waves) or several miles (like some discovered by Marconi) were wireless waves, what of those in between? Without going into detail, it may be said that radiant heat, or “infra red rays,” were found to fill the gap, and later, in the zone of waves shorter than light, science discovered X rays, gamma rays, and cosmic rays. Thus it had a whole array of forces—wireless, radiant heat, visible light, invisible or ultra violet light, X rays and the gamma rays of radioactivity, and cosmic rays all carried through space by Clerk-Maxwell’s

“electromagnetic pulses,” and differing only in the effects they produced and in the wave lengths of the pulses carrying them. The array of pulses, classified by wave-length, was called the *electromagnetic spectrum*, after the spectrum of visible light, which fitted into this greater one.

Waves Due to Vibrations

Such an array of waves, graded in order of wave-length, suggested that all such pulses must have a common cause, differing only in details of operation. Early in the 20th century scientists decided that their newly-developed theory of matter (see Atom and Atomic Theory) had revealed this cause. It lay in the various vibrations of the protons and electrons of which all matter was supposed to be made, and different types of vibration sent out different lengths of waves—just as a great storm rolls up ocean waves as high as a ship, with their crests far apart, while a light breeze causes ripples only an inch or two apart. The waves, however, were not supposed to be anything like water waves, their nature is discussed under Light. Moreover, experience suggested that, unlike water waves, electromagnetic pulses, whether of radio, light, or X ray, travel at the same speed, this being 186,284 miles a second.

As a matter of convenience, science arranged all these pulses into octaves, according to their frequency (the number of waves passing a point in one second), and said that waves in some of the octaves were wireless waves, those in other octaves were light waves, and so on. The name “octave” was borrowed from music, in which a note having twice as many vibrations a second as another is the latter’s octave.

At the low-frequency, or long-wave, end of this octave system stood pulses given off by electrical machinery and having a frequency of less than a hundred waves a second, with a corresponding wave length of more than 45 miles. At the high frequency, short-wave end, now stand pulses vibrating 100 trillion times a second, with such short waves that some 10,000 million would be needed to span an inch. This gives a range of some 60 octaves of frequencies, of which visible light occupies only one octave.

Wireless Waves—the Longest of All

The longest waves of which science has knowledge and which can be put to practical use are those giving us wireless. Some, used in transoceanic communication, are several miles from crest to crest, whilst others are much shorter—perhaps an inch or less. Scientific experiments have produced wireless waves as short

RADIATION

as one tenth of a millimetre—about one-twentieth the width of a fine pencil mark. Thus the whole span of wireless, or Hertzian, waves, occupies some 28 octaves of the spectrum, of which 11 are employed in practical wireless.

Wireless waves also illustrate another fundamental feature of the spectrum. They are long waves, so, on the analogy of ocean waves, we should expect them to arise from tremendous electronic activity. This is the fact, for it takes great swarms of electrons, surging round specially devised circuits of the wireless transmitter type, to send them hurtling through space. Less violent activity would be expected to produce shorter waves—which is indeed the case.

Infra-red Rays

The next longest waves are those which impart heat to the objects they strike. Science tells us that heat arises from increased activity of the molecules composing material objects (see Heat), so it would seem that infra red waves warm objects by stimulating their molecules to greater activity. Also we might expect such waves to arise from increased molecular activity in the objects emitting them. This is indeed the case, from the sun

which sends its heat hurtling across space to the planets in the form of infra red rays, to a stove or radiator not even hot enough to glow.

Here again our relation between wave length and the degree of activity required to create the wave holds good. The longest infra red wave overlaps the shortest wireless wave. From this length, infra red waves are graded in length to those produced by a single molecule or atom—that is, to where vibrations *within* the atom begin to produce visible light. The dividing line is at wave lengths of about a quarter of a millionth of an inch. Thus the infra-red waves occupy some nine octaves of the spectrum.

Next smaller than the infra-red waves are those causing visible light. They occupy only one octave of the electromagnetic spectrum, between about one quarter and one eight-

millionth of an inch, and are generated, according to modern theory, by electrons shifting in their orbits within atoms, (See Quantum Theory). The articles on Spectrum and Light deal with the visible octave in some detail.

Ultra violet Rays and X-rays

Next in order come the ultra violet waves or rays of great interest because of their effect on health and uses in industry. Important biological properties of these rays are their sterilizing effect or power to kill simple organisms, such as bacteria, and even human cell tissue; the ability to form pigment under the skin, resulting in tanning, freckles and sunburn, and their part in the creation of vitamin D by their action upon ergosterol (See Vitamins). Many kinds of electric lamps for producing ultra violet rays are made, emitting rays of different characteristics, for use in artificial sunlight treatment of human illness.

The common type is the electric arc, another produces the rays by means of an electric current through hot mercury vapour inside a bulb of quartz or special glass, used because glass will not allow the rays to pass.

Ultra-violet rays have strong effects on

many chemical reactions, and are used industrially for many purposes, such as hastening the hardening of oil used on the surface of patent leather. Numerous substances will *fluoresce*, or shine in the dark, when exposed to the invisible ultra violet rays. Live human teeth, for example, fluoresce, where is dead teeth will not, so that the rays may be used to advantage in dental diagnosis. Forged documents or faked works of art are examined under the ultra-violet rays, either by fluorescence or photography or both, to obtain information as to original states or as to attempted fraud or alterations. Both the ultra-violet rays and the X rays affect photographic plates just as do visible light rays, so that photographs may be taken using camera lenses of quartz since, unlike glass, it permits passage of the rays.

LENGTHS OF MAIN WAVE GROUPS

	WAVE LENGTH	FREQUENCY (Complete waves per second)
	(Metric units)	
	30 000 metres	10 000 (10 ⁻¹⁰)
WIRELESS WAVES (Practical Use)	0 metres	13 000 000 (13 ⁻¹⁶)
VISIBLE WAVES	0.1 millimetres	2 000 000 000 (2 ⁻¹⁹)
INFRARED RAYS	500 millimicrons (millionths of 1 millimetre)	175 000 000 000 (175 ⁻¹⁷)
LIGHT	100 millimicrons	750 000 000 000 (750 ⁻¹⁶)
ULTRA VIOLET RAYS	10 millimicrons	75 000 000 000 000 (750 ⁻¹³)
X RAYS	0.1 millimicron	1 000 000 000 000 000 (3 ⁻¹⁴)
GAMMA RAYS	0.002 millimicron	150 000 000 000 000 000 (150 ⁻¹⁴)
COSMIC RAYS	0.00001 millimicron	1 700 000 000 000 000 000 (170 ⁻¹⁶)

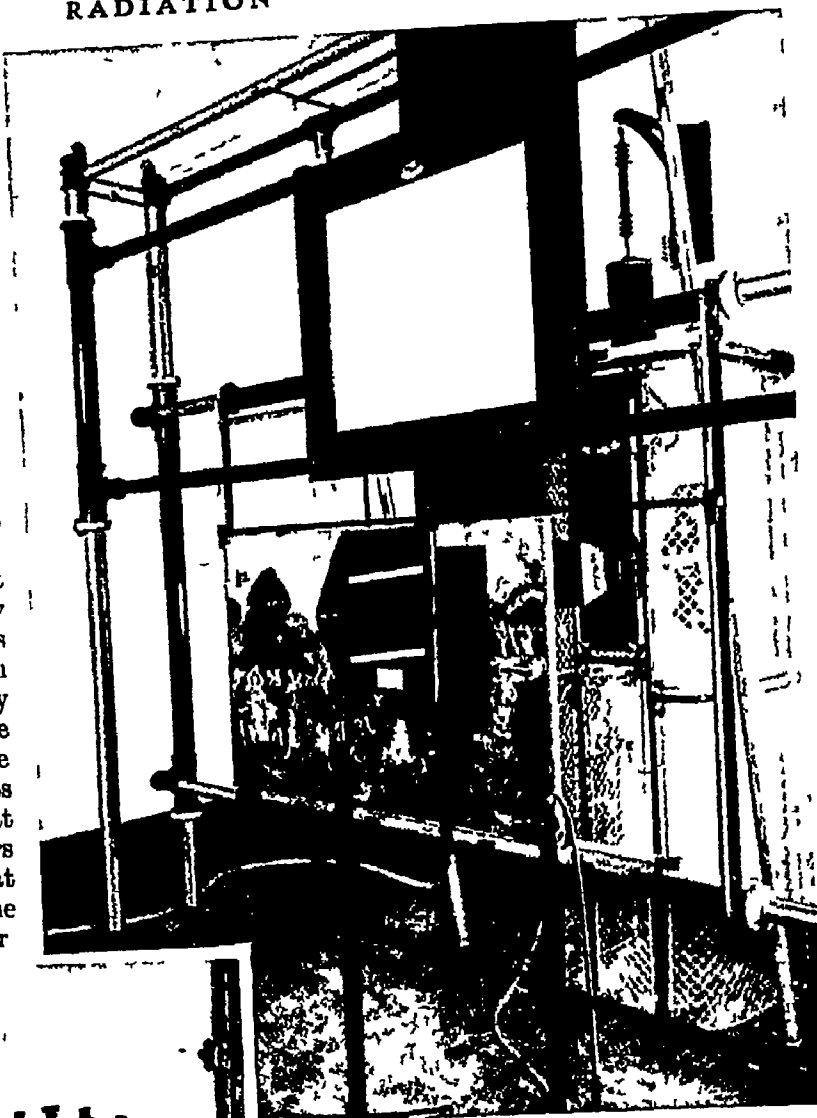
The name of each group of waves is set between the figures for the upper and lower limits. While equally spaced in the table the different zones really are extremely unequal as examination of the figures will show. Light has by far the smallest zone—only one sixtieth of the entire range.

RADIATION

The entire ultra-violet zone extends from wave lengths of about one eight-millionth of an inch to one fourth of that length, where they overlap the longer X-rays. How these are generated and studied is told in the article on X rays. The very short X-rays overlap the gamma rays given off by radioactive substances (See Radium and Radioactivity). The shortest of these are only about one twenty-thousand-millionth of an inch long.

'Cosmic Rays' the Shortest of All

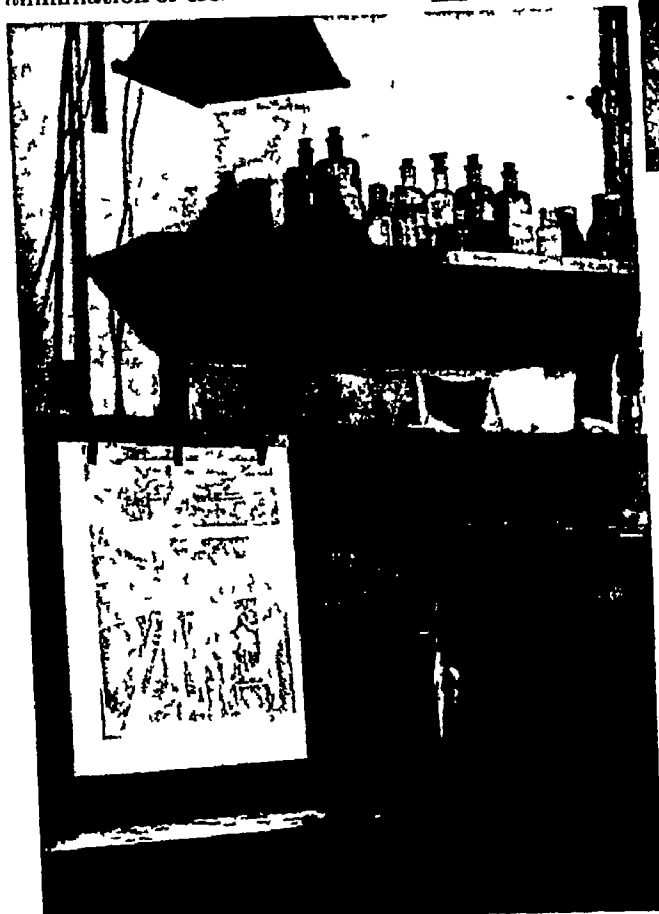
Below these come the shortest waves of all—"cosmic rays". These rays, which were first detected in 1903, were studied by Kohlhörster, Millikan, and others quite recently. Their wave length is too short to be measured by any apparatus now known. Some are powerful enough to penetrate 18 feet of lead. Many physicists believe that they originate in great atomic changes occurring in stars or in interstellar space, and that the changes may arise from the annihilation or creation of matter.



X RAYS DETECT PICTURE RESTORATIONS

The photograph above shows a machine by which X-ray examinations can be made of "old masters". When paintings are under the X-rays the image on the fluorescent screen (above) or the transparency (left) shows up all the paint that has ever been put on the canvas, often revealing the original work beneath many later coats of paint.

Photos Hulton, courtesy of the National Gallery



Few concepts in science have brought more varied phenomena together, or have explained them in terms of one theory so beautifully, as has this picture of the electromagnetic spectrum. Its very beauty blinded scientists to several defects. One was the sheer impossibility of conceiving a wave motion such as shown in the article on Light moving outward in concentric spheres. Another was the failure of the Michelson-Morley experiment to detect "ether drift". Scientists felt, however, that sooner or later these matters would be cleared up without upsetting the theory, and it was not until the beginning of the 20th century that doubts arose, born of discoveries in other fields, particularly in corpuscular radiation, giving birth to the Relativity and Quantum theories.

RADIATION

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millionth of an inch, and are generated, according to modern theory, by electrons shifting in their orbits within atoms, (*See Quantum Theory*). The articles on Spectrum and Light deal with the visible octave in some detail.

Ultra-violet Rays and X-rays

Next in order come the ultra-violet waves or rays of great interest because of their effect on health and uses in industry. Important biological properties of these rays are their

sterilizing effect, or power to kill simple organisms, such as bacteria, and even human cell tissue. The ability to form pigment under the skin, resulting in tanning, freckles, and sunburn, and their part in the creation of vitamin D by their action upon ergosterol (*See Vitamins*). Many kinds of electric lamps for producing ultra-violet rays are made, emitting rays of different characteristics, for use in artificial sunlight treatment of human ills. The common type is the electric arc, another produces the rays by means of an electric current through hot mercury vapour inside a bulb of quartz or special glass, used because glass will not allow the rays to pass.

Ultra-violet rays have strong effects on

many chemical reactions, and are used industrially for many purposes, such as hastening the hardening of oil used on the surface of patent leather. Numerous substances will *fluoresce*, or shine in the dark, when exposed to the invisible ultra-violet rays. Live human teeth, for example, fluoresce, whereas dead teeth will not, so that the rays may be used to advantage in dental diagnosis. Forged documents or faked works of art are examined under the ultra-violet rays, either by fluorescence or photography or both, to obtain information as to original states or as to attempted fraud or alterations. Both the ultra-violet rays and the X-rays affect photographic plates just as do visible light rays, so that photographs may be taken using camera lenses of quartz since, unlike glass, it permits passage of the rays.

LENGTHS OF MAIN WAVE GROUPS

	WAVE LENGTH	FREQUENCY
	(Metric units)	(Complete waves per second)
	30 000 metres	10,000 (10×10^3)
WIRELESS WAVES (Practical Use)	0 metres	33,000,000 (33×10^6)
ELECTRIC WAVES	0.4 millimetres	750,000 000,000 (75×10^9)
INFRA RED RAYS	800 millimicrons (millionths of 1 millimetre)	375,000,000,000,000 (375×10^{12})
LIGHT	400 millimicrons	750,000,000 000 000 (750×10^{12})
ULTRA VIOLET RAYS	40 millimicrons	75,000,000,000,000,000 (750×10^{13})
X-RAYS	0.1 millimicron	3,000,000,000,000,000,000 (3×10^{18})
GAMMA RAYS	0.002 millimicron	150,000,000,000,000,000 000 (150×10^{15})
COSMIC RAYS	0.000063 millimicron	4,760,000,000,000,000,000 000,000 (47.6×10^{20})

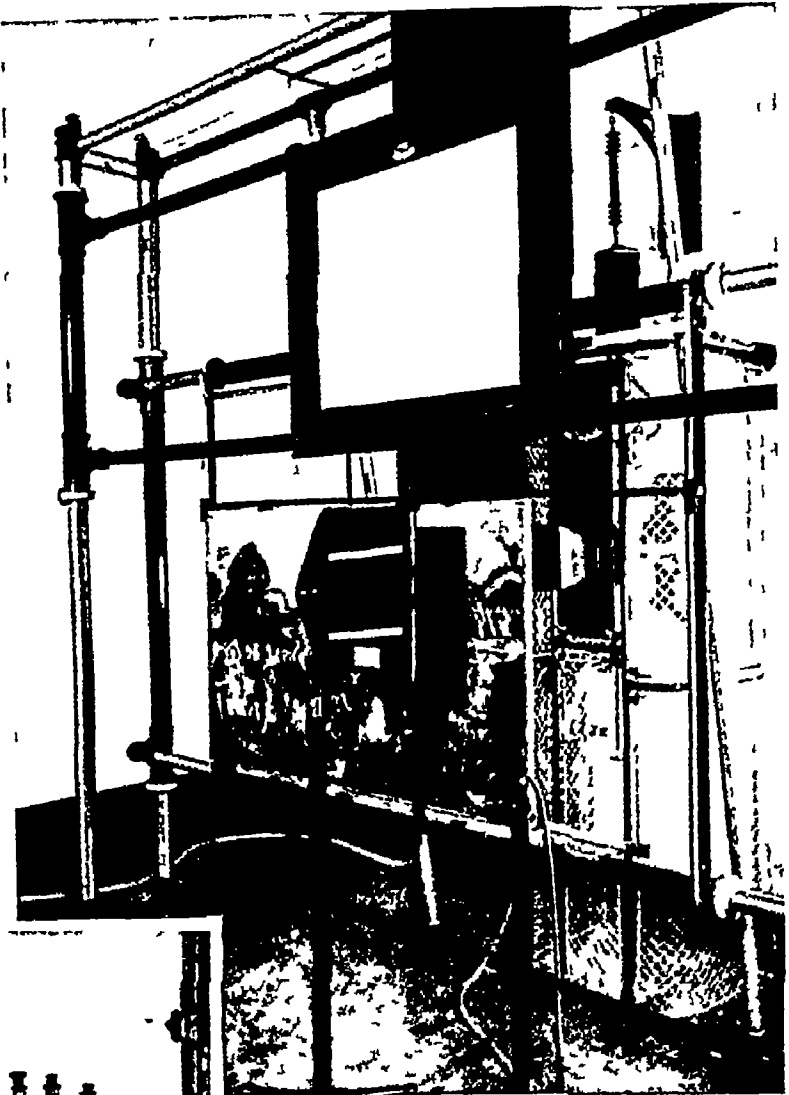
The name of each group of waves is set between the figures for the upper and lower limits. While equally spaced in the table, the different zones really are extremely unequal, as examination of the figures will show. Light has by far the smallest zone—only one-sixtieth of the entire range.

RADIATION

The entire ultra violet zone extends from wave-lengths of about one eight-millionth of an inch to one-fourth of that length, where they overlap the longer X-rays. How these are generated and studied is told in the article on X-rays. The very short X-rays overlap the *gamma rays* given off by radioactive substances (See Radium and Radioactivity). The shortest of these are only about one twenty-thousand-millionth of an inch long.

'Cosmic Rays' the Shortest of All

Below these come the shortest waves of all—"cosmic rays." These rays, which were first detected in 1903, were studied by Kohlhorster, Millikan, and others quite recently. Their wave length is too short to be measured by any apparatus now known. Some are powerful enough to penetrate 18 feet of lead. Many physicists believe that they originate in great atomic changes occurring in stars or in interstellar space, and that the changes may arise from the annihilation or creation of matter.



X RAYS DETECT PICTURE RESTORATIONS

The photograph above shows a machine by which X-ray examinations can be made of "old masters." When paintings are under the X-rays the image on the fluorescent screen (above) or the transparency (left) shows up all the paint that has ever been put on the canvas, often revealing the original work beneath many later coats of paint.

Photos: Hutton, courtesy of the National Gallery



Few concepts in science have brought more varied phenomena together, or have explained them in terms of one theory so beautifully, as has this picture of the electromagnetic spectrum. Its very beauty blinded scientists to several defects. One was the sheer impossibility of conceiving a wave motion such as shown in the article on Light moving outward in concentric spheres. Another was the failure of the Michelson-Morley experiment to detect "ether drift." Scientists felt, however, that sooner or later these matters would be cleared up without upsetting the theory, and it was not until the beginning of the 20th century that doubts arose, born of discoveries in other fields, particularly in corpuscular radiation, giving birth to the Relativity and Quantum theories.

SOLVING *the* RIDDLE of RADIUM

The most valuable element is one that can be preserved only with the greatest difficulty, so eager is it to split up and vanish away This mystery is explained here as simply as is possible

Radium AND RADIOACTIVITY "If the whole ocean were mercury," said the alchemist, "I could turn it all to gold," so firm was his belief in the possibilities of "transmutation," which to him meant changing base metals to gold. When 19th century scientists established the atomic theory of chemistry and the principles of conservation of mass and energy in physics, the alchemist's transmutation was considered a foolish dream. Yet it had been going on for ages in the earth, and in 1896 the distinguished French scientist, Henri Becquerel, found the first clue pointing to it.

In an effort to enlarge knowledge of the newly discovered X-rays, he had been experimenting with compounds of the metal uranium. In the course of the experiments, he found that the compounds produced images on photographic plates, no matter how carefully they were shielded from light. This effect was quickly found to be electrical in nature, and led many to suspect that the phenomenon had something in common with the newly discovered "electrons." Meanwhile, another line of investigation, suggested by Becquerel's findings, was leading to a discovery which revealed transmutation actually at work, and revolutionized all scientific theories of matter.

Discoveries by the Curies

Mme Curie (*q v*), while working with her husband, Pierre Curie, professor of physics at the Sorbonne in Paris, learned that many extracts of uranium ores gave a stronger "Becquerel effect" than uranium itself. This, they thought, could only be caused by some hitherto unknown element being contained in the ores, and they started searching for it. The work was extremely laborious, for it soon became apparent that a ton of the ores would yield only minute traces of the element sought. In 1898, however, enough was obtained in the form of a chloride to permit identification as a chemical element. It was found to have an atomic weight of 226, to belong to the alkaline earths like calcium, to be a white metal melting at about 1,292° F., and to combine readily with water, air, and the acids. But these chemical details were scarcely of any interest in comparison with one startling fact: the new element seemed to be constantly disintegrating, giving off enormous amounts of energy in proportion to its bulk and yet seeming (at the time) to suffer no loss of weight whatever. So the element was named radium and its emission of energy radioactivity, after the Latin *radius*, a ray.

The Becquerel effect now was seen to be due to the radioactivity existing in uranium, to a less degree than in radium.

This apparent defiance of natural law challenged the attention of the scientific world. In 1899 Rutherford, working with uranium, answered part of the riddle when he found that the effused energy was of at least two different kinds, which he named alpha and beta rays. Villard soon after found a third kind, called gamma rays. All these rays were emitted by radium. By 1903 Rutherford and Soddy were able to give an explanation of the disintegration of radium which in its general features is accepted today.

Why Radium Splits Up

According to them, every atom is composed of a core of relatively dense particles, each one of the same composition as the nucleus of a helium atom. That is, it contains electro-positive particles (now called protons) and surrounding them are much less massive, electro-negative particles, then already identified as electrons. Thus was the theory of the electrical nature of matter born.

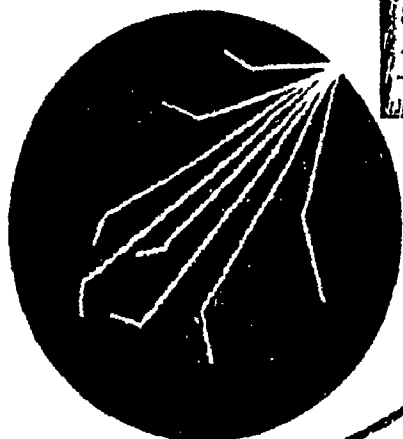
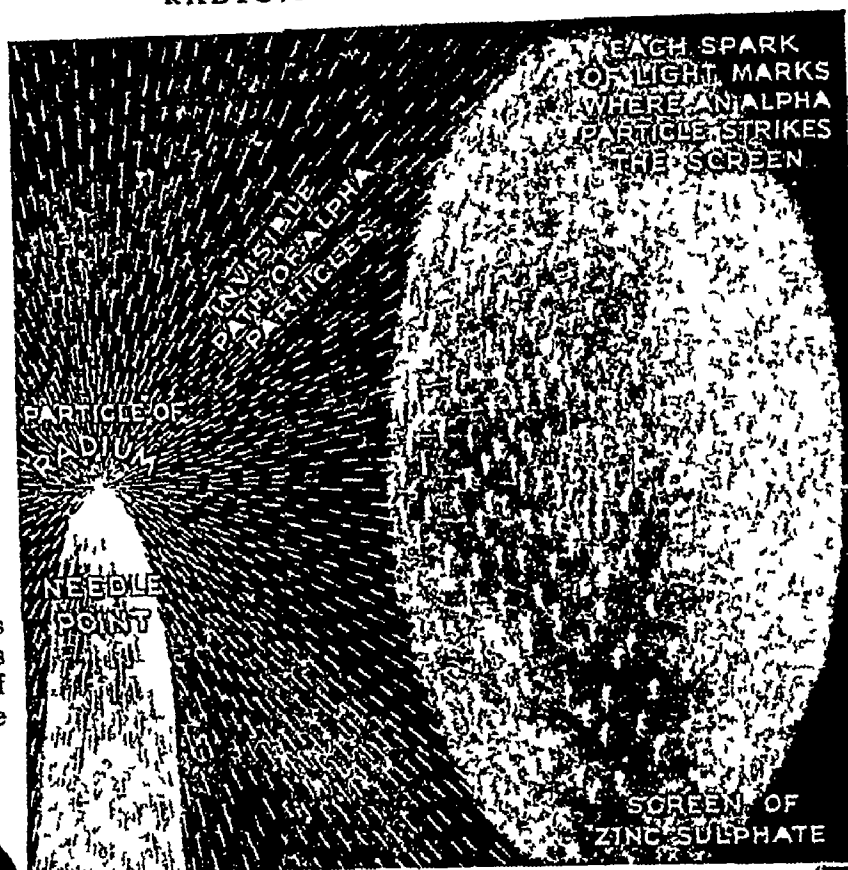
The explosive powers of radium are due, according to these and other investigators, to the fact that the two kinds of particles are loosely bound in the atom, and occasionally some break loose and shoot forth from the atom with enormous speed. Alpha rays are positively charged helium nuclei shooting out from one to three inches from the nucleus at speeds of about 6,000 to 12,000 miles a second—from 5,200 to 10,500 times as fast as the swiftest rifle bullet. Beta rays are negatively charged electrons, erupting from the atom at speeds sometimes nearly equal to that of light (186,284 miles a second). The gamma rays are not streams of particles, but electro-magnetic radiations like X rays of extremely short wave length.

Each type of radiation has the power to penetrate matter to distances depending upon its total energy. Alpha rays can penetrate aluminum foil to a depth of one-tenth of a millimetre, beta rays can penetrate four millimetres of such foil, or one millimetre of lead, while it takes a piece of iron one foot thick to stop the intensely penetrating gamma rays.

How radium fulfils the alchemist's dream of transmutation follows from this. Scientists found that the alpha particles (consisting, as we have seen, of helium nuclei) promptly gathered in the electrons they needed to become stable helium atoms. This was the first transmutation.

RADIUM

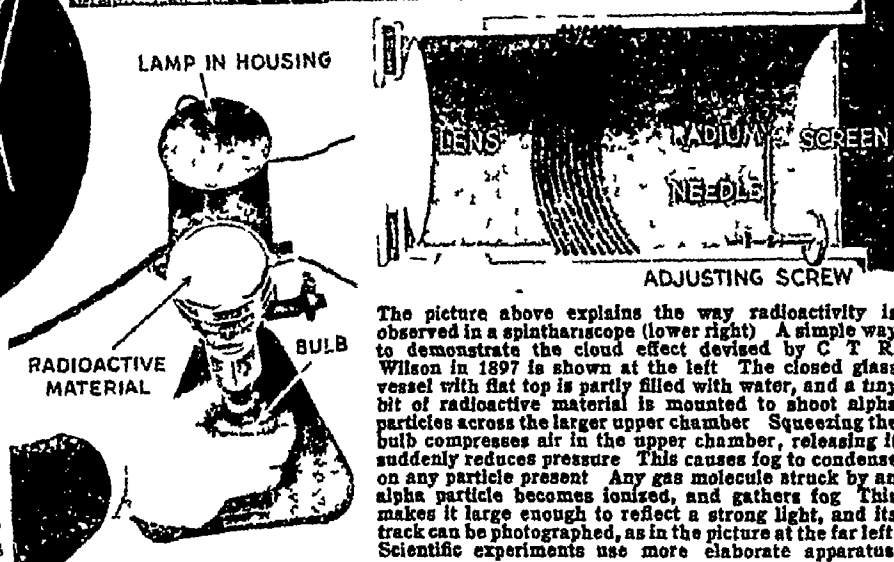
But there were others. Alpha particles are emitted at such a rate that, if an ounce of radium were obtained, it would give over 385,000 million such particles a second. Naturally, no mass of radium could do this for ever, and still remain radium, for after an alpha particle had left an atom, those remaining would rearrange themselves, and the atom of radium would become an atom of something else. This rearrangement proceeds at such a rate that after 1,700 years one half of any mass of radium will have become "radium emanation," or radon (sometimes called niton), an inert gas resembling helium. Part of the radon will in turn have



become a still lighter element, polonium.

The same is true of other radioactive elements, such as uranium and thorium. In fact, the radioactive elements may be arranged in three series, and throughout each series transmutation takes place. The uranium-radium series, in which some of the successive products are uranium, ionium, radium, radon, and polonium, the thorium series, and the actinium series, in both of which successive products are known by their parent names, with letters designating the successive products of transmutation, as thorium B, thorium C, and so on.

Where does this power of transmutation end? Curiously enough, where the alchemist often started. He often sought to transmute lead into gold. Nature's transmutation by radio



The picture above explains the way radioactivity is observed in a spinthariscopes (lower right). A simple way to demonstrate the cloud effect devised by C. T. R. Wilson in 1897 is shown at the left. The closed glass vessel with flat top is partly filled with water, and a tiny bit of radioactive material is mounted to shoot alpha particles across the larger upper chamber. Squeezing the bulb compresses air in the upper chamber, releasing it suddenly reduces pressure. This causes fog to condense on any particle present. Any gas molecule struck by an alpha particle becomes ionized, and gathers fog. This makes it large enough to reflect a strong light, and its track can be photographed, as in the picture at the far left. Scientific experiments use more elaborate apparatus.

SEEING THE 'SHOTS' THAT RADIUM FIRES

activity results in lead. When the radioactive substances, by successive transmutations, become lead, their atoms achieve electrical stability, no further eruptions occur, and the lead remains lead.

Different transmutations in these series take enormously different times, the customary unit being the "half-period"—that is, the time taken for half of a given mass of radioactive substance to become transmuted to the next in the series. The half-period of uranium, the heaviest element, is the longest—5 thousand million years! For ionium it is 500,000 years,

RADIUM

and for radium 1,700 years. Some of the half-periods are only days or minutes, and for actinium C only two-thousandths of a second. Estimating the relative amounts of radioactive substances, lead, and helium in different minerals, and applying these half-periods to see how long radioactivity must have been going on to achieve such proportions, is one way of estimating the age of the mineral, and, from that, of the earth.

The commonest and most fruitful experiments with radium have been those using strong electric and magnetic fields. These are made possible not only because the alpha and beta particles can be deflected in their flights by such

If all goes well, the flying particles either kill or reduce the harmful cells. The objection is that they are almost as liable to do the same to normal cells in the vicinity, and the problem of achieving beneficial effects while avoiding harmful ones presents many difficulties.

The difficulties of preparing pure radium salts may be imagined from the fact that the richest ores contain only about five to ten grammes in a hundred tons. To obtain a pound, well over 2,500 tons of ore would be needed. In the whole world only about one-fifth of a pound of radium is extracted annually. The costliest of products, it is usually sold as chloride, bromide or sulphate, at about £14,000 a gramme, which is at the rate of nearly £400,000 an ounce, but so much as an ounce has never been assembled in one place.

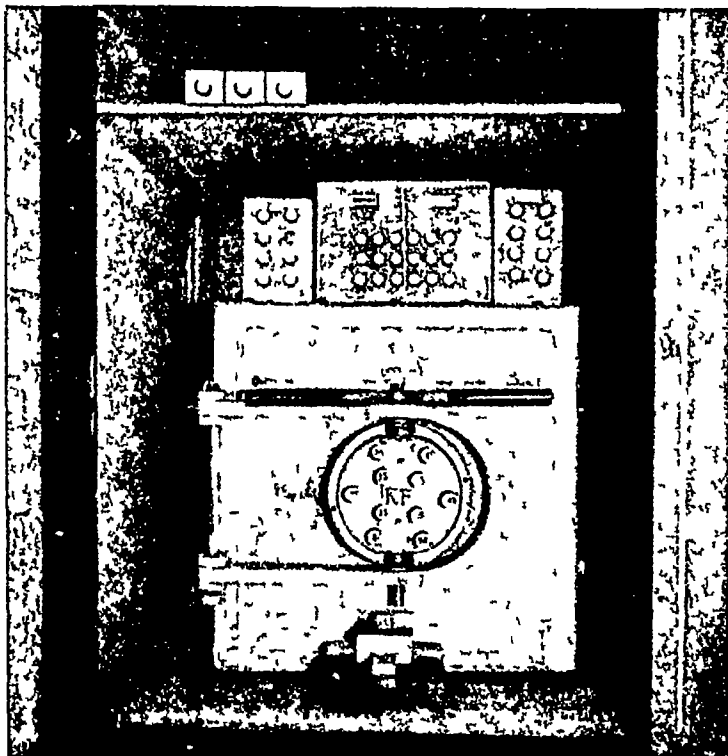
Radium occurs in various ores in pitchblende, in carnotite, uraninite, and in small amounts in other minerals. It is always associated with uranium and usually with lead. Pitchblende came first from the vicinity of Joachimstal, in Bohemia.

The somewhat richer ores of the Belgian Congo have given the world much of its radium of late, but deposits, said to be the largest in the world yielding about 10 grammes per 100 tons, are being worked in the Great Bear Lake



fields, but also because their tracks can easily be made visible, making it possible to measure the deflections. For one thing, the impact of these particles against a screen of zinc sulphide or similar material makes fluorescent spots on the screen, and the spots can be made to shift by electric and magnetic fields. Another method is the "cloud chamber," devised by C. T. R. Wilson in 1897. Since these methods reveal the amount of deflection produced by a given electrical or magnetic field, and the experimenter knows the strength of the field he is using, he can calculate the mass and electrical charge of the particles being studied.

Radium is used by scientists to bombard the atoms of gaseous elements with its alpha particles, in order to knock electrons loose from these elements and thus reveal facts concerning their atomic structure. By far the commonest use of radium, however, is in medicine, in the treatment of foreign growths such as cancer. Minute quantities of radium salt or of radon (the gaseous emanation of radium) are enclosed in capsules, and these are placed near the growth to be destroyed.



HANDLING AND STORING RADIUM

Prolonged exposure to X-rays is extremely dangerous, and those who are called upon to handle radium daily have to be specially protected. The worker in the upper photograph wears lead-glass goggles and lead-rubber gloves. The lower photograph shows where the radium supply at the Middlesex Hospital is stored—in a lead block, weighing a ton, inside a safe.

region in northern Alberta, Canada. These are at present almost inaccessible to transport, except by aircraft.

Radium salts are prepared from these ores by dissolving the uranium fraction in suitable solvents, separating as far as possible the minerals known not to contain radium, then crystallizing and recrystallizing—the concentration of radium being higher with each crystallization—until finally the purified salt is obtained.

The elements known to be radioactive are radium, polonium, uranium, thorium, actinium, protoactinium, rubidium, and potassium. Others may be so, but too slightly to be recognized with present instruments. Artificial radioactivity has been induced in light elements such as aluminum and boron, by bombarding them with swiftly-moving neutrons. In some instances, helium nuclei are emitted and an atom of another element is formed. Thus the alchemist's dream of transmutation has come true at last.

Radnorshire, WELSH CO. This inland county of Wales, which has an area of 471 square miles, is everywhere hilly, and there are many fine open vales. In the centre is the wild mountainous tract known as Radnor Forest, which reaches 2,163 feet at its highest point. The chief rivers are the Wye and its tributaries, and the Teme, which joins the Severn. The Wye valley is noted for its beauty and also for its medicinal springs. Of the many waterfalls in the hilly districts, perhaps the best-known is "Water break its Neck," in the neighbourhood of New Radnor.

Sheep farming is the most important industry. Presteign (population, 1,100) is the county town. Other towns are Knighton and the popular spa, Llandrindod Wells. The county's population is about 21,000.

Raffles, SIR THOMAS STAMFORD (1781-1826) Raffles was born on a merchant-ship off Jamaica, worked as a clerk in the office of the East India Company, became Lieutenant Governor of Java, ended slavery there, founded the important British settlement of Singapore, former wonderful natural history collection (which was destroyed when the vessel on which he was returning to England caught fire), and founded the Zoological Society.

When this great Empire builder planted the Union Jack in 1819 on the ruins of an old fort, Singapore was a village inhabited by a few native fishermen. The Home Government gave Raffles little or no credit for his far-sighted action in acquiring the post, and even charged up his widow for expenses incurred!

Rail, COOT AND MOOR-HEN. On almost every piece of water in Britain, from tiny pool to wide lake, you may find one or other of these birds, for the group contains our commonest water-fowl. The typical rails have small bodies,



ON THE SEARCH FOR RADIUM

All the hospitals in the world are clamouring for more radium, but the world's annual production does not exceed about three ounces. These miners are prospecting at Labine Point on the Great Bear Lake in the North West Territories, Canada, where pitchblende (radium-containing) deposits have been found.

usually very narrow, so that they can slip easily in and out of the reed-beds in which they live. Except on migration, they run rather than fly, and one species from New Zealand—for these birds are found in all parts of the world—is actually flightless. All of them have little or no tail, and short, rather feeble wings.

The water-rail (*Rallus aquaticus*), although not very rare, is so shy that it is seldom seen. It lives in dense reed-beds, and, being coloured brown streaked with paler hues, is hard to see; its beak is long, slender, and red in colour. This bird, like most members of the group, makes a big, messy nest of rushes, often very close to the water's edge, in which are laid ten or so eggs, buff with darker spots. (See page 2878)

The land-rail, or corn-crake (*Crex pratensis*), once common in agricultural districts, is now not often seen, though you may still hear the curious creaking note—to which its generic name is due—in corn-fields. It is paler than the water-rail, and has a much shorter beak.

Among the other members of this group, which sometimes breed in Britain, the commonest is the moor-hen (*Gallinula chloropus*) or



LAND-RAIL, MOOR HEN AND COOT—ALL MEMBERS OF ONE FAMILY

The family likeness of these three birds is seen in the beak, which is short and wedge-shaped, and in the broad, thick build. The land-rail, more usually called the corncrake, is no longer common in Britain, but the other two are the commonest of our water-birds, one or other of them being present wherever there is a pond, lake or stream with room enough to swim. The land-rail is brown, the others are blackish, the moor-hen has a red patch above its beak, and that white mark distinguishes the coot.

Photos John Kearson Arthur Brook I J Langford

water-hen as it is also called. Often found on the most insignificant piece of water, it is easy to recognize, being almost black, with white markings and white under the tail, the beak is red. This is the bird which makes such a fuss if you disturb it suddenly, when it half-runs, half flies across the surface of the water with wildly flapping wings. Fishermen dislike it because it often disturbs the water in this way. Its nest and eggs are much like those of the water-rail, though often situated some way from water or in a pollard tree, the newly-hatched

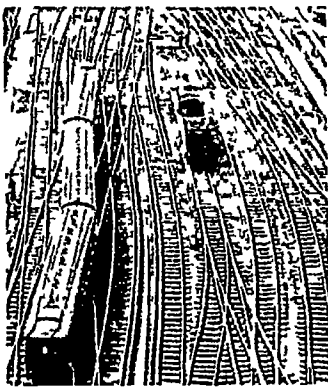
young, which can swim at once, are tiny balls of blackish fluff.

The coot (*Fulica atra*) is a larger, blacker edition of the moor-hen, on its beak and forehead there is a white, naked patch—hence the phrase “as bald as a coot.” Like the moor-hen, the coot swims and dives well, and its feet instead of being properly webbed, have curious fringes along the toes. They support the bird on the mud and yet permit it to run well on dry land. All the birds mentioned above are related to the cranes.

LINES of STEEL across the EARTH

The railway, though now not a novelty, retains its romance—the romance of travelling vast distances and linking previously sundered communities, the romance of the Orient Express, the Blue Train, the Frisco Limited

Railways. Today the “non horse” speeds along steel tracks laid across the countries of the globe, drawing trains which carry people of



every race and products of every land. Trains cross mountains, dash through forests, roar through tunnels, and pass safely over bridges that are monuments of engineering skill. Who invented these railways? How are they operated? And what is their importance, that we spend

money and energy in building them?

It is only a little over a century since the first of the “non horses,” or locomotives, came into existence. But long before that a queer road of wooden rails laid end to end was built for horse-drawn wagons that hauled coal from our mines. The tracks were raised above the level of the mud, fastened to the ground, and

provided with flanges or ridges on the outer edges to prevent the wheels from slipping off the track, or “tramway.” These were the first “rail” ways. Later the wooden rails were covered with strips of metal, the flanges were put on the wheels instead of on the track, and several loaded wagons, linked together, were sometimes hauled by a single horse.

With the invention of the modern steam engine (qv) by James Watt, men began to study how to apply this new power to hauling these tracks. A stationary engine was at first used, which stood at the end of the line and wound up a cable drawing the wagons along. The credit for inventing the first moving steam-engine is given to Richard Trevithick, who in 1804 took out a patent for a steam “locomotive,” but it was too imperfect for practical use. For a time it was believed that cog-wheels, fitting into cogs in the rails, would be necessary for drawing a train of heavily loaded trucks or wagons, but before 1812 it had been proved that a locomotive with smooth wheels on smooth rails could draw heavy loads even up a moderate incline.

RAILWAYS

At this stage of progress Wilham Hedley invented in 1813 a locomotive for use in the coal mines round about Newcastle-on-Tyne, which on account of its loud noise was called "Puffing Billy." In the next year George Stephenson brought out a locomotive which was used on a nine mile tramway between a mine and its seaport, but it could not move a train much faster than a horse could walk. Then in 1825 came Stephenson's engine, "Locomotion No 1," for the Stockton and Darlington Railway, in which the exhaust steam was sent up the chimney, causing a powerful draught in the fire-box.

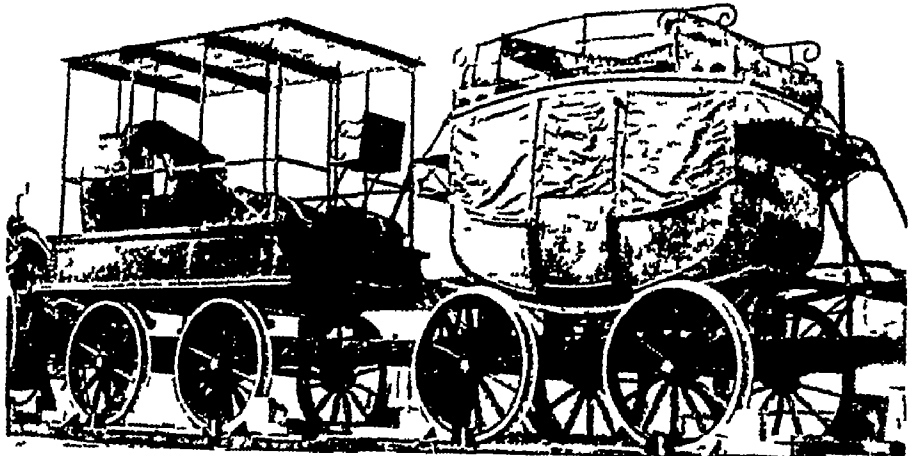
First Passenger Trains

Thus caused more rapid generation of steam and gave more power to the engine. Soon afterwards, in 1829, the winner of the Rainhill Trials, Stephenson's famous "Rocket," made use of a multitubular boiler, and the essentials of the successful locomotive were complete. (See Locomotive Stephenson, George) The engines increased in size and improved in detail, but today's monsters of 150 tons or more are the direct modern descendants of the old "Puffing Bilies" and "Rockets." Railways soon ceased to be private conveyances and became public carriers, for the Stockton and Darlington Railway was built for general traffic, and the first coaches for passengers were run over this line. The public line from Liverpool to Manchester, on which the "Rocket" was used, was formally opened on September 15 1830.

A hundred years later, railways were found on every continent on the globe, with more than 350,000 miles of railway in North and South America, 250,000 miles in Europe, 80,000 in Asia, and 50,000 in Africa and Australia. British railway mileage exceeds 20,000, and some 600,000 persons are employed in the service. In the United States there are no fewer than 260,000 miles of railway, and in Canada 41,000 miles (mostly the transcontinental systems of the Canadian Pacific and the government owned Canadian National).

The world's longest line is the 5,435 mile Trans Siberian Railway from Leningrad and Moscow to Vladivostok, built by the Russian Government and finished in 1904. Connecting with this is the "Turk Sib," running southward into Russian Turkistan, this was completed in 1929.

In Europe the most interesting international train is the Simplon Orient Express, which, with its connections, gives through travel from Calais to Istanbul, Athens, and Asia Minor. Other expresses include the Nord (Paris Berlin), Côte d'Azur (to the Riviera) and the Rome Express.



OLDEST AND NEWEST IN RAILWAY ROLLING-STOCK

How's this for contrast? Who ever would have thought that the queer-looking carriages in the upper picture would evolve into the whale-shaped train in the lower photograph? The top one is the first train that ran in the U.S.A.—from Albany to Schenectady in 1831, the other is America's latest type of train a feature of which is the low centre of gravity.

Photos above: Topical Press below: Associated Press

Not the least remarkable thing about railway travel in Great Britain is the immunity from serious accidents. The death risk to passengers is almost infinitesimal, and some experts claim that the risk would be even smaller if all-steel coaches were generally used, as is the case in many foreign countries.

In 1923 the numerous railway companies operating in Great Britain were reorganized to form

RAILWAYS

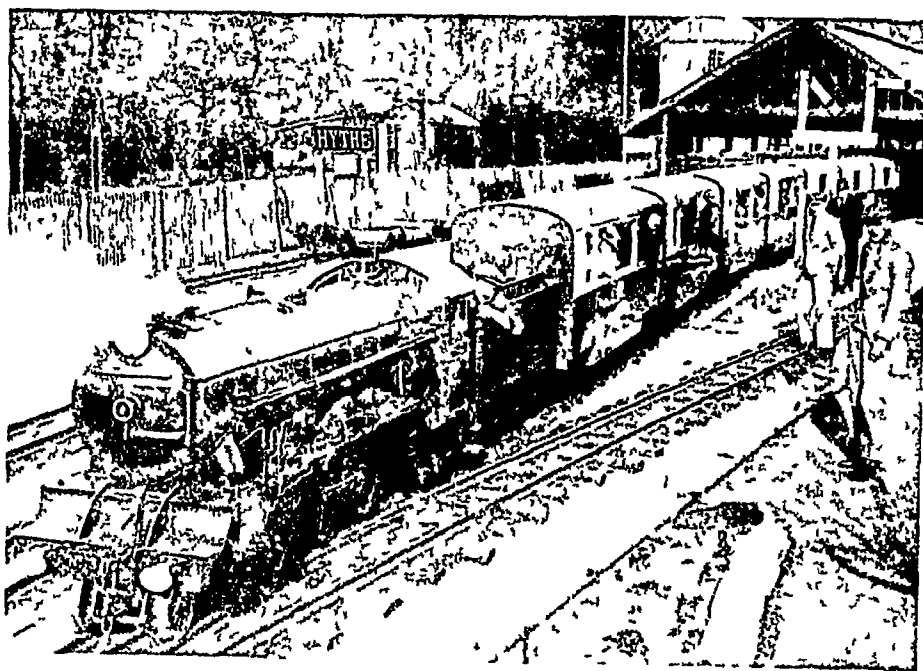
four great groups—the London, Midland and Scottish (6,940 miles), including the old London and North Western, Midland, Lancashire and Yorkshire, North Staffordshire, Furness, Caledonian, Glasgow and South Western, and Highland, the London and North Eastern (6,380 miles), comprising the former North Eastern, Great Eastern, Great Central, Great Northern, Hull and Barnsley, North British, and Great North of Scotland, the Great Western (3,793 miles), made up of the Great Western, Cambrian, and various Welsh lines, and the Southern (2,185 miles), consisting of the London and South Western, London, Brighton and South Coast, and South Eastern and Chatham

to mileage In London is the Railway Clearing House, which deals with through bookings between the various lines There is a great deal of cooperation between the railways, and some stations and lines are used by two companies The Ministry of Transport has general control

The most "spectacular" trains in Britain are probably those operated by the LMS and LNER on the main lines between London and Scotland The LMS operates the "West Coast route," from Euston and St Pancras to Glasgow, via Crewe and Carlisle, while the LNER keeps to the east coast, and runs from King's Cross to Edinburgh via York and Newcastle Their fastest expresses, the

streamlined "Coronation Scot" and "Coronation," do the journey in 6½ and 6 hours respectively from terminus to terminus The LMS "Royal Scot" and the LNER "Flying Scotsman" are two of the oldest scheduled express services in the world

The GWR have their famous "Cheltenham Flyer" and "Cornish Riviera" expresses to the West Country from Paddington The SR have important expresses running from their London headquarters, Waterloo, and this station, Victoria, and London Bridge share most of



THOUGH TINY, IT'S A REAL RAILWAY

This little locomotive, a small-scale copy of the "Flying Scotsman," is capable of doing 60 miles an hour, though such a speed is not possible on this miniature Romney, Hythe and Dymchurch Railway The train, which weighs eight tons, is seen pulling out of Hythe station on the smallest public railway in the world When alighting, it's a case of "mind your head"

This grouping applies to all British railways except London Transport, the Irish railways (the LMS, it may be noted, have running powers in Northern Ireland), and a few isolated "light" railways, like the fascinating Romney, Hythe and Dymchurch (See illustration above)

The standard gauge (i.e., the width from rail to rail) on the British, and most of the world's railways, is 4 ft 8½ inches The historic "battle of the gauges" on the GWR, which followed the introduction by the famous engineer, I K Brunel (q.v.), of a broad gauge of 7 ft, lasted until the latter was abolished in 1892

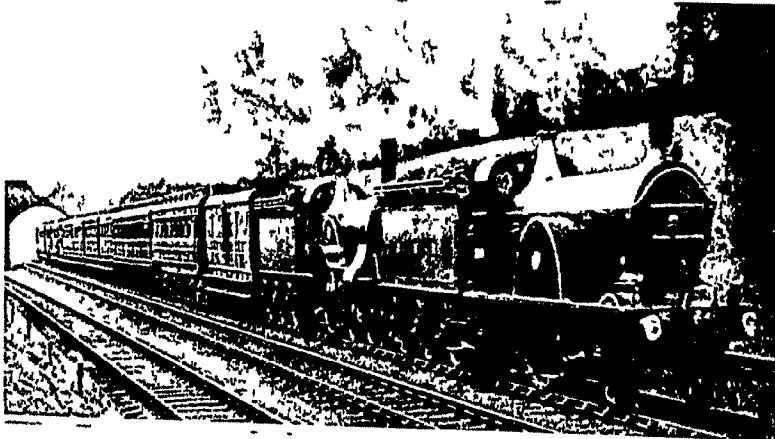
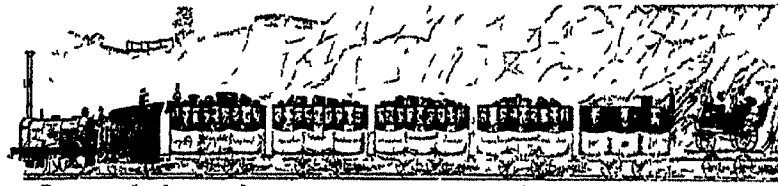
There are—except on a few of the LNER and SR boat-trains, on which "second class" remains—only two classes of travel on British lines—"first" and "third" Season tickets and "cheap day return" and excursion tickets are issued, and all fares are worked out according

to the heavy Continental boat-train and suburban traffic The most famous boat-train is the luxury "Golden Arrow" to Paris An innovation is the train-ferry from Dover to Dunkirk

The "Southern Electric" is the biggest electrified railway system in the world, and development of services to the resorts of the south coast has been rapid The London Underground, now under the unified control of the London Passenger Transport Board, is the envy of the world (See Tunnels, Underground)

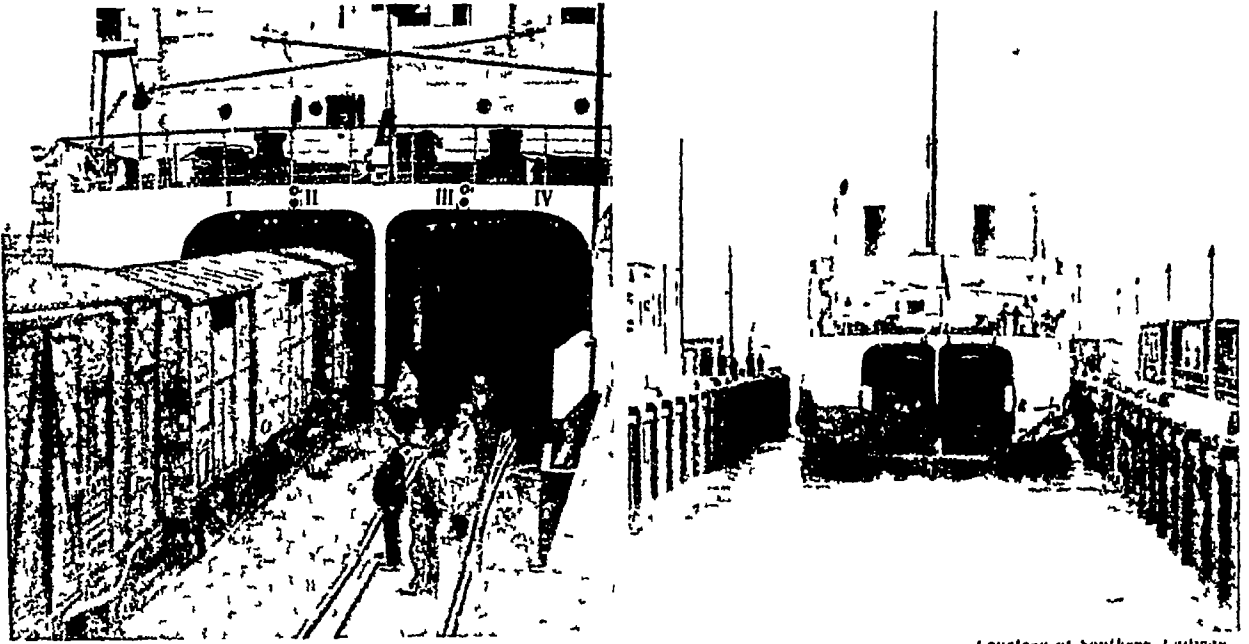
Most long-distance trains have corridor coaches, enabling passengers to walk almost from end to end, Pullman cars (owned by an independent company), sleeping cars (on Continental routes, owned by companies like Wagons-Lits or Mitropa), dining and refreshment cars, mail and luggage vans, barbers' shops, and so on, while (particularly in America)

A CENTURY OF PROGRESS IN RAILWAY TRAVEL



Judging by the upper pair of illustrations in this page, railway travel in the early days must have been most uncomfortable. The top print shows how people travelled first class on the Liverpool and Manchester Railway in 1825, the quaint old photograph below it, taken about 1853, shows passengers on the first Metropolitan Railway train, running between Farringdon and Paddington stations, London. The lower pair of photographs show the "Flying Scotsman" of 1899, drawn by a "Stirling 8-Footer," with a later type of "single-wheeler" in front, and the streamlined "Coronation Scot" of the L.M.S. Railway.

Photos second London Passenger Transport Board third Fox bottom T. R. Wethercatt



Courtesy of Southern Railway

CARRYING A TRAIN ACROSS THE CHANNEL

A sleeping-car express can leave London at night and arrive in Paris in time for breakfast the next morning without disturbing the passengers, thanks to the train ferry. On arrival at the docks the train runs directly from land to vessel and there is no delay in craning goods aboard. On the left, wagons are seen entering a ferry-boat on the Dover-Dunkirk service; on the right the loaded ferry-boat is seen under way. The boats can each take 12 sleeping coaches or 40 loaded goods wagons.

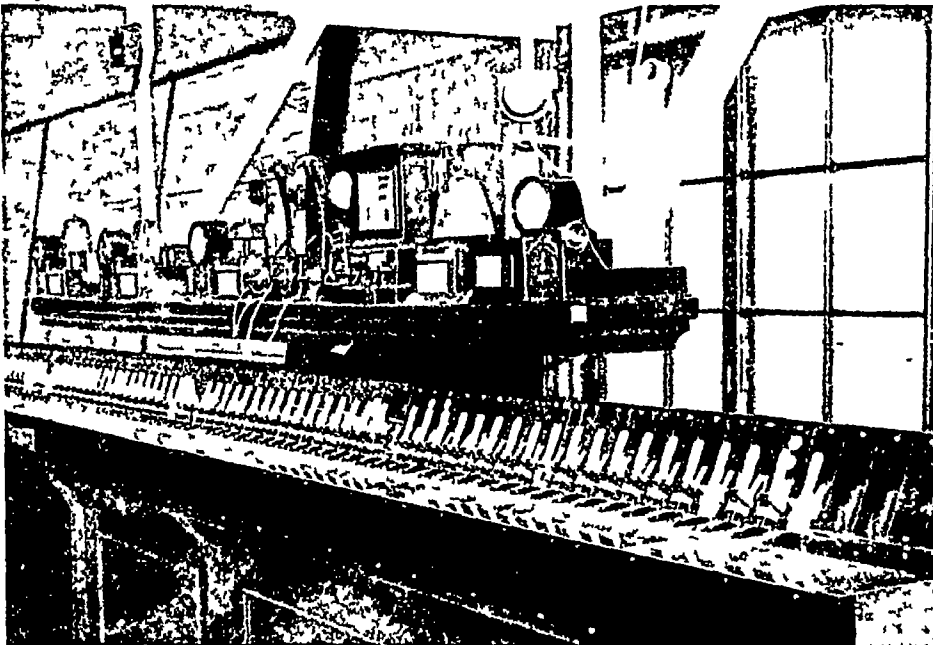
observation cars are sometimes added. On the longest non-stop, provision must also be made for the engine crew to change over during the run. This is done by connecting the tender and the train by means of a vestibule, similar to those which connect the coaches. The relief driver and fireman ride in the foremost coach until the time comes for them to take over. Enough coal to last out the run is carried in the

tender, but the water is picked up from troughs between the rails while the train is travelling at full speed.

The railway companies own not only the actual track and equipment, including an enormous quantity and variety of "rolling-stock" (think, for example, of all the different kinds of goods wagons there are), but also construction works, repair shops, docks, steam

ships, hotels, motor vehicles, and even aeroplanes. To operate a railway system efficiently, a huge army of workers must be employed—drivers, firemen, stokers, guards, platelayers (those who work on the "permanent way" under "gangers"), stationmasters, ticket-collectors, booking clerks, signalmen, porters, and the host of railwaymen who clean and overhaul the rolling-stock while we are in bed and asleep. The National Union of Railwaymen is one of the biggest of all trade unions.

Signalling is a very important item



The Times

ALL-ELECTRIC SIGNAL BOX

Railway signals and points are worked from a signal cabin. At one time they were all manually operated by means of huge levers pulled by the signalmen. At large junctions these are now being replaced by an electric system, like that at King's Cross, seen above. Here are 232 levers in a frame, electrically connected with the vast network of signals and points outside the station.

RAILWAYS

Most of our signals are manually operated, and it is the signalman's job to work the signals and points by his own efforts. The ordinary square end "semaphore" arm is a "home" signal, while the fish tailed arm is a "distant" signal, giving warning of what lies ahead.

A great safeguard is the automatic block system, as used on the London Underground. A "block" may be a mile or several miles long. So long as all points are closed and no train is in the block, an electric current flows through the rails and the signal at the block entrance shows "clear." When a train enters the block, its wheels and axles short-circuit the current, and the signal changes to "stop." An automatic stop halts the train if the driver should run past a stop signal.

On some lines, more particularly on the Southern Electric, what is called electric "colour light" signalling has been introduced. This incorporates red, yellow, and green signals like traffic signals on the road, and does away altogether with the familiar semaphore-arm type of signals.

Some of the greatest triumphs in railway engineering have been in the tunnels cut through the Swiss Alps, such as the Simplon (over 12 miles long), St. Gothard (11½ miles) and Lotschberg. In England there are six railway tunnels which are over three miles in length, the longest being the Severn Tunnel (4 miles 642 yards). The highest point reached by a railway in Britain is the summit of Snowdon (3,140 feet), but in Chile and Peru there are railways crossing the Andes which at their highest point are over 15,000 feet above sea level.

Mountain railways—of which that up Snowdon is the only example in Britain—need a different type of power from the ordinary locomotive. This is usually provided either by "rack and pinion" or by the funicular principle, in which the weight of one car descending pulls the other up on ropes.

The motor coach, motor car, and motor lorry have proved very serious competitors to the railways, and a considerable amount of traffic has been transferred back again to the highways, reversing the revolution which occurred when the railways superseded the stage coaches about a hundred years ago. Notwithstanding this rivalry, at one London terminus alone an average of 230,000 passengers arrive or depart every day of the year.

The Blue Riband for the fastest train (start-to-stop) in the world over a regular run is

RAINBOW

now held by one of the streamlined trains of the Deutsche Reichsbahn (German State Railways), hauled by a Diesel (oil driven) locomotive, which runs between Berlin and Hanover, a distance of 157 miles, at an average speed of 82.3 m.p.h. It is noteworthy that the fastest schedules of Germany and the U.S.A. are all by Diesel driven trains. British steam trains cover



WORLD'S STEEPEST RAILWAY

What a thrill there must be in ascending Mount Pilatus, Switzerland, on this railway, for the gradient in places is as steep as one in two! It is quite safe, though, for it is built on the rack-and-pinion principle of toothed rails.

the world's longest non-stop runs, and keep up a very high speed.

Rainbow. No doubt you have heard the story of the foolish children who set out to find the end of the rainbow, believing that there they would find a pot of gold. But they never got to the end, because the rainbow is merely the result of refraction and reflection of the sun's rays from the backs of countless raindrops in the sky.

Rainbows are seen, you have noticed, when the sun is shining behind you and rain is falling in front of you at a distance. To understand how the beautiful arch of many colours is formed you will have to read the articles on Light, and Spectrum and Spectroscope. They tell you why a ray of light passing through a three-sided piece of glass is bent, or refracted,

RAINBOW

so that the seven colours of which white light is composed are all sorted out, separate and distinct. Now much the same thing happens when you see a rainbow. The raindrops act like minute prisms. The rays of the sun are bent as they enter the raindrop, then reflected from the back of the drop, and bent again as they pass out. The result is that they are broken up into the seven prismatic colours, which we see as a rainbow.

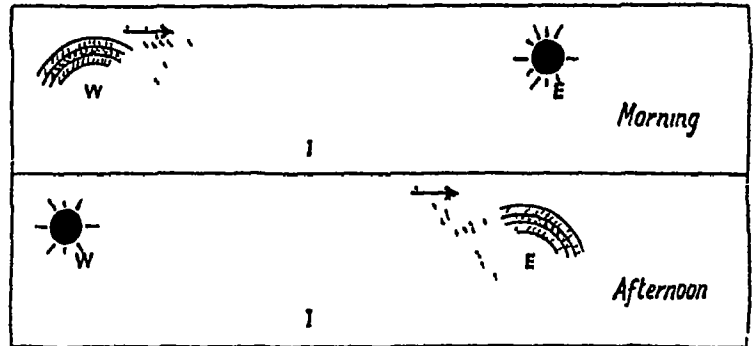
Sometimes two rainbows are seen at once, one inside the other. The outer bow, which is the result of a double reflection within the raindrops, is fainter than the inner bow, and the order of the colours is reversed.

On any sunny day you can produce your own rainbow with a lawn sprinkler, or by throwing a stone into the water so that it makes a big splash. When the sun is in the right position beautiful rainbows are also seen in the spray of great waterfalls.

In bygone ages men were greatly perplexed by the rainbow, and, not understanding how it was produced, they invented fables to explain it. The ancient Greeks used to imagine that it was a sign placed in the heavens by the gods to foretell war or heavy rain. The slender, golden-winged Iris was the goddess of

RAINFALL

the rainbow, who bore messages from the gods to men. The Norsemen believed that the rainbow was the bridge over which the gods passed from earth to their home in the sky. In the Bible we are told how the rainbow appeared in the sky after the Great Flood as a sign that God would not send such a disaster again.



RAINBOW AS WEATHER-SIGN

This diagram shows at a glance how the rainbow is an indication of coming or past rain when the wind is blowing from west or south-west. A morning rainbow (that is, one seen in the west through raindrops between it and the observer) means approaching rain, while one seen in the afternoon shows that the storm is over. I=observer, W=west, E=east.

Looking at a street lamp in mist you see a distinct halo round it. Similar haloes are occasionally seen surrounding the sun or moon. A true halo like that shown in the colour plate opposite is due to the refraction of light by ice crystals in the air, and often has its inner edge tinged with red.

Rainfall. The richest land in the world is worth exactly nothing at all for agriculture without rainfall or irrigation—and irrigation depends upon rainfall for its original water supply. With few exceptions, the value of land for agriculture increases as the amount of rainfall received in a year increases.

Human beings and the majority of the plants and animals which are most useful to them flourish best where rainfall is neither excessive nor scanty. Men exist in discomfort in Cherrapunji, in Assam, with its 450 inches of annual rainfall, and also on Walvis Bay, South-West Africa, with its 0.3 inch. But the regions of moderate and regular rainfall support the largest and most prosperous populations.

Vegetable life varies even more directly with the amount of rainfall. It becomes scanty or extinct in dry regions, such as the Sahara and Central Australia; it grows sturdy and abundant in regions of moderate, evenly distributed rainfall, like the greater part of Europe and the eastern United States, while in excessively moist regions its luxuriance is almost beyond control.

Rainfall depends, first of all, on evaporation and then on wind. The wind carries water vapour unchanged until condensed through cooling. In the belt of calms or "doldrums" round the Equator the moist air rises and cools, and the moisture, becoming condensed, falls.

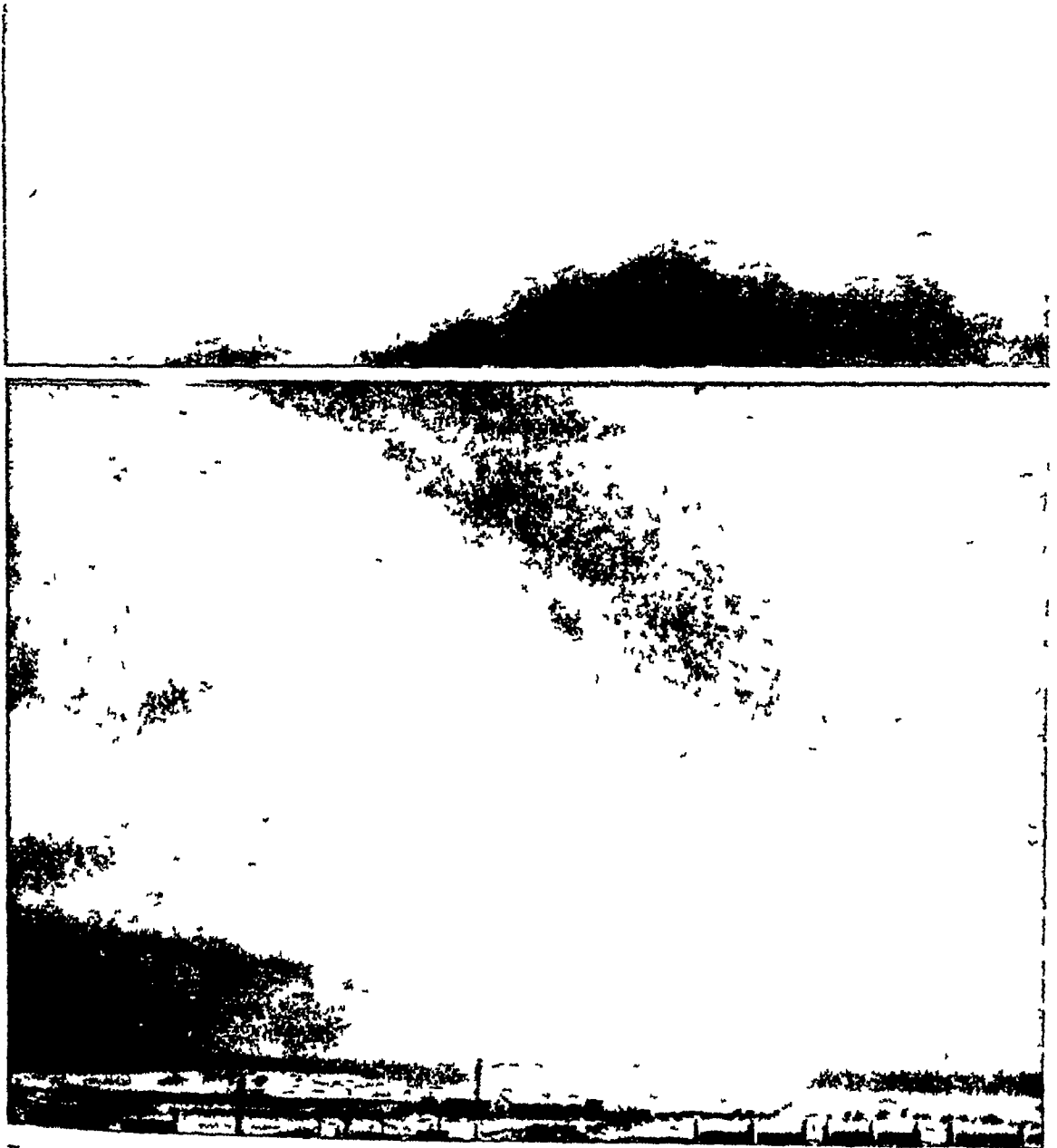


MEASURING THE RAINFALL

In this type of rain-gauge, the rain enters through the tube in the lid of the chamber to the left, which also contains a barograph—the round drum—for recording the atmospheric pressure. From the bottle-shaped vessel, the rainwater is being poured into a measuring cylinder.

Courtesy of Negretti & Zambra

BEAUTIFUL RAINBOW AND A HALO ROUND THE SUN



The rainbow (bottom) is the sun's rays broken up into their constituent colours by the moisture-saturated atmosphere and reflected back to the human eye. In this picture a double bow, not a very common sight, is shown. The solar halo (top) is also due to refraction, caused, in this case, by crystals of ice in the upper air. Commonly it is a whitish ring with blurred edges, but sometimes its light is broken up into lovely prismatic colours. Note here the warm grey of the nimbus cloud rimmed with cream, and the bluish grey of the sky within the arch.

U A Clarke



RAINBOWS HIGH & LOW

OF all the common weather phenomena the rainbow is probably the least understood. It is due, of course, to the refraction and reflection of the sun's rays by raindrops in the air, and we must always stand with our backs to the sun to see it. Now, a rainbow is really part of a circle the centre of which is as far below the horizon as the sun is above it, thus, in the upper of these two photographs the rainbow is very low, so the sun must be very high—in other words the photo was taken about noon. In the lower picture the reverse is the case, and the photo was taken in the evening.

Photos top D. West
bottom J. Dixon Scott



RAINFALL

in heavy thunder showers (See Storms) These occur nearly every afternoon all the year round, so that the rainfall may be well above 100 inches a year. Tropical South America and Africa owe their heavy rains to this cause. Thunder showers occur almost everywhere on the surface of the earth, but become less frequent as one travels away from the Equator.

The trade winds are rainless when they rise on land and blow towards the sea. They are travelling towards the Equator, are being heated, and consequently are gathering, not losing, moisture. Only when they blow inland and are forced to rise over a mountain range are they cooled sufficiently to cause rain. Some of the driest regions of the earth lie within or on the margin of the trade wind belt—the Sahara, Arabia, Central and Western Australia and the south western United States. So also do some very moist regions, such as the heights of Asia and the islands of the East Indian Archipelago.

To the region of prevailing westerlies rain is brought by (1) thunder showers, (2) warm south winds drawn in by the cyclonic storms, and (3) the prevailing west winds from the oceans, which drop their moisture when they are cooled on rising over mountains or on passing over surfaces cooler than themselves.

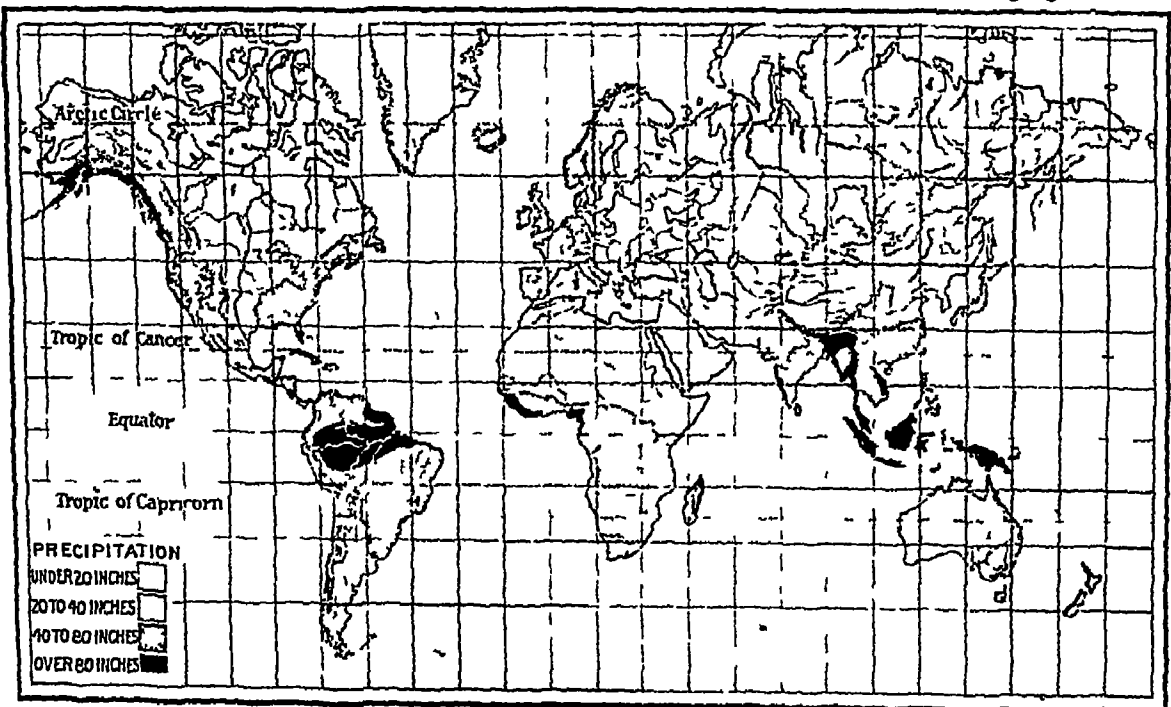
Of the rain bringing winds in the belt of the prevailing westerlies, the cyclonic storms have by far the most beneficial influence. Their rains are for the most part gentler and less heavy, and

are better distributed throughout the year. They have, too, what is known as a "rhythm" of rain and sunshine, which is essential for the proper ripening of cereals, especially wheat, which rots if it has too much moisture in the growing season. Thus Russia, Siberia, France, Hungary, and Argentina are ideal cyclonic storm wheat regions. Portions of these same regions are situated so far inland that they never receive any of the moisture from the south winds, or they may be so heated by the sun that they tend to prevent precipitation.

Mountains Make the Rain Fall

The earth's water carriers, winds, it will be seen, must first have a chance to draw water, and then be forced by cooling to deliver their load. Mountain ranges are particularly efficacious in making the winds "stand and deliver," and therefore every great mountain range has a wetter side to windward and a drier side to leeward. Sometimes one face receives ten times as much rain as the other. Because winds which visit high plateaux, like those of Bolivia, Peru, Tibet, and Iran, have been robbed of most of their moisture before they reach the heights, such regions are always dry.

Taking the lands of the world as a whole, Europe and the eastern United States, each with an average moderate rainfall—that is, from 20 to 80 inches annually,—are nearly encircled by a belt of desert, beginning with the Sahara, Arabia and Iran (Persia), swinging north-



HOW RAIN FALLS ALL OVER THE WORLD

You will notice that the regions of heaviest rainfall, over 80 inches a year, are all situated either in the neighbourhood of the Equator or on the seaward side of great mountain ranges. The Amazon valley, the west coast of Africa, and the islands of the East Indies are examples of how moisture-laden air rises above hot land masses becomes cooled in the upper altitudes, and drops its moisture in the form of violent showers. The north-west coast of North America and north-eastern India show how damp winds from the sea rise over high mountain ranges and precipitate their abundant moisture.

eastward through Tibet, Mongolia, Siberia, and Alaska (except the damp coastal fringe of the latter), then dipping sharply southward through Western Canada and the United States

Around this belt of desert runs a rainy belt comprising the world's dampest lands—the Pacific coast of North America and the Aleutian Islands, then southward in Asia to the belt of heavy tropical and equatorial rains running round the world through the East Indies, Indo-China, India, the Congo and Amazon basins, the West Indies, and Central America. The wettest districts in the British Isles, with a mean annual rainfall of over 40 inches, are in the hilly west, facing the Atlantic

Rainfall may be measured by catching the rain in any flat-bottomed, perpendicular-sided vessel, placed exactly level where it will receive the full average rainfall, and measuring the depth with a very thin ruler—a thick one would raise the water level. As it is difficult to measure small quantities accurately, a special rain-gauge has been devised. The average rainfall of London is about 25 inches

Raisins. The dried fruits of certain varieties of grape containing a large proportion of sugar are called raisins. Raisin grapes are grown chiefly in the Mediterranean countries, and in Australia and California. Since the drying is done in the sun, the raisin industry is confined to those regions which can boast several weeks of rainless weather

Some raisins are obtained by simply letting the grapes dry on the vine, others by partially cutting the stem of each cluster to reduce the flow of sap and then letting them dry. More often they are cut from the stem when ripe and laid on trays in the sun for several days. The finest raisins are made from a variety of the muscatel or muscat grape, and many seedless types have now been developed. Sultanias or sultana raisins are obtained from small seedless grapes grown near Smyrna

Rajputana, (Pron rahj-poo-tah'-na), INDIA. Though not a province of British India, Rajputana is a great area of central India composed of 21 native States. The most important of these—Jodhpur (Marwar), Udaipur (Mewar), Jaipur, and Bikaner—are ruled by hereditary princes owing allegiance to the British Crown. The Rajputana Agency has an area of 131,000 square miles, and the population numbers 11,500,000. The Province of Ajmer-Merwara (2,700 square miles) lies geographically within Rajputana

The Aravalli Hills and the rivers Banas, Lunj, and Chambal are physical features of the area. Agriculture is extensively practised, and there is great mineral wealth. Jaipur (population, 144,000) is the largest city, but Jodhpur and Udaipur equal or even surpass it in beauty and splendour

Rajputana gets its name from the ruling class, the Rajputs, who are widespread over the whole of northern India

The ADVENTUROUS LIFE of RALEIGH

We seem no longer to produce great men of the type of Sir Walter Raleigh, who was not only historian and poet, adventurer, soldier, and sailor, but a discoverer of valuable plants. He touched life at every point

Raleigh, SIR WALTER (Pron rah-le) (About 1552–1618). Politician, soldier, sailor, explorer, poet, and historian, Raleigh (also spelled



Sir Walter Raleigh's birthplace

Raleigh) stands out as an illustrious example of the versatile genius of the men of Queen Elizabeth's time, and of the stirring and adventurous life of the day

But his greatest title to fame rests on his efforts to colonize the New World. His was the vision of a new England beyond the seas, a vision which made

an irresistible appeal to an intellect among the keenest and an imagination among the boldest of a time which abounded in keen intellects and

bold imagination. And he strove to realize this vision through many weary years of failure and disappointment

Born at Hayes Barton, Devonshire, about 1552, Raleigh entered Oriel College, Oxford, in 1568, but left the next year to fight on the side of the Huguenots in France. In 1580 he distinguished himself in the suppression of the Irish rebellion in Cork, and soon afterwards appeared at Court and quickly became a favourite of Queen Elizabeth. You remember the story of how he won the Queen's favour by gallantly throwing his costly cloak on a muddy spot in her path so as to enable her to walk over it dry-shod

Raleigh's tall and handsome figure, his dark hair, lofty forehead, resolute bearing, courtly manners, and spirited wit combined to form an imposing personality, and all the advantages that Nature had given him were heightened by a gorgeous splendour in dress and jewels. But he was proud, haughty, and impatient,



SIR WALTER IS CHARMED BY SPENSER'S POETRY

In 1588 or 1589, while in Ireland, Raleigh made the acquaintance of the poet Edmund Spenser. The artist has pictured a scene in Spenser's rooms where the poet is reading to the courtier his great poem, "The Faerie Queene." So delighted with the work was Raleigh that he used his influence at court to secure a pension for Spenser and also obtained financial help from Queen Elizabeth (honoured in the poem as "Gloriana") for the publication of the masterpiece.

and so made hosts of enemies and was never fully admitted to the Queen's counsels in matters of state. Elizabeth however, lavished numerous favours upon him throughout her reign, and he discharged with conspicuous ability the responsibilities of several important positions to which she had appointed him.

Before his appearance at court Raleigh had gone with his half-brother, Sir Humphrey Gilbert, on some rather mysterious voyages of discovery, but up to that time England did not own a foot of land in America. Raleigh's new position at court gave him wealth and opportunity to push his great project, although the Queen would not let him lead any of his colonizing expeditions in person.

Raleigh was tireless in his efforts to settle "our people in America," and sent out expedition after expedition. The name of "Virginia," in honour of the "Virgin Queen," as Elizabeth was called, given to the area explored by one of the expeditions (1584), alone remains to testify to his efforts, for none of his colonies survived. Nevertheless, the pioneer work of Raleigh paved the way for later colonists. Curiously enough, too, by making the smoking of tobacco popular he helped to create a demand for the plant by the culture of which the colonists later found a sure road to wealth.

Raleigh was in Ireland (where he had introduced the potato and tobacco plants) when the Spanish Armada (1588) appeared in English waters, but as Vice-Admiral of Devon he may have had a share in the work of that exciting time (See Armada). In the years which followed he took part in various expeditions against the Spaniards. In 1595 he sailed at the head of an expedition to Guiana, in search of the fabled El Dorado, and on his return empty-handed, after much hardship and suffering, he wrote his fascinating "The Discoverie of Guiana."

Raleigh's Fall from Grace

Raleigh's popularity at Court had been waning since his marriage to one of Elizabeth's maids of honour, Elizabeth Throgmorton, which enraged the jealous Queen. With the accession of James I (1603) complete disaster overtook him. The Scottish King suspected that Raleigh had worked against his becoming King of England, so he deprived Raleigh of his numerous offices and privileges. In anger Raleigh then took a part in one of the many plots then brewing, and was arrested and tried on a charge of conspiring against the King's life.

Although no satisfactory evidence could be produced, Raleigh was condemned to death, and only on the scaffold was his sentence commuted to imprisonment for life. His admirable



SIR WALTER RALEIGH

Sir Walter Raleigh was one of the most romantic figures of the robust Elizabethan age which in many ways he typified. Sometimes glamorous, sometimes sordid, his life was always exciting, and his death typical of that cruel age.
National Portrait Gallery

bearing during the trial turned public opinion in his favour. One of his enemies said "When the trial began I would have gone a thousand miles to see Raleigh hanged, before the trial closed I would have gone a thousand miles to save his life."

The next 13 years Raleigh spent in the Tower of London, where he was visited by many of the great scholars and poets of the day. Most of the time his wife and son were permitted to live with him. During this period he worked on a "History of the World," for King James's son, Prince Henry, whose favour he enjoyed. Only one volume of the "History," down to 130 B.C., was finished and published.

Raleigh finally persuaded the King to release him in 1617, on condition that he should lead an expedition to the river Orinoco and bring back some of the gold from a mine he said he had discovered on his previous expedition.

Raleigh returned to England without finding his mine. James arrested him and had him executed (1618) under his old sentence, which had never been revoked. Cheerful and resolute to the last, when Raleigh was led to the scaffold he asked to see the axe, and, touching the edge, said "This is a sharp medicine, but it is a sure cure for all diseases." Thus died the man who gave the first great impulse to the movement of English colonization.

Ramsay, Sir William (1852-1916) For more than a century before 1894 everybody believed that air consisted only of oxygen and nitrogen. In analysing air, when the amount of oxygen it contained was found, it was assumed that what was over was nitrogen.

In 1894, before the British Association, Lord Rayleigh and William Ramsay announced, to the astonishment of all, that a new gas had been found in the atmosphere. On account of its chemical inertness this gas was called argon, from the Greek for "without work." Besides argon, Ramsay discovered four other new gases—helium, neon, krypton, and xenon.

Born in Glasgow, Ramsay studied in his native city and later in Germany. He was principal of University College, Bristol, from 1881 until 1887, when he was made professor of chemistry at University College, London, a post that he held until 1912. He was knighted in 1902 and received the Nobel Prize for chemistry in 1904.

Rangoon, BURMA This ancient city, long prominent as the capital of Burma, added to its importance when the latter country was separated from India in 1937.

Rangoon's greatest glory is the Shwe Dagon pagoda, covered with pure gold. This pagoda



RANGOON'S FAMOUS PAGODA

This magnificent bell-shaped pagoda, the Shwe Dagon, is entirely covered with gold to the top of the pinnacle, 370 feet high. The numerous shrines clustered around it are ornamented with coloured glass inlay and wood carvings.

Photo Col. H. J. I. Rodd

is not only one of the principal shrines of the Buddhist religion, but is acknowledged to be one of the masterpieces of Oriental architecture. By contrast, the government house quite close at hand is an entirely modern building. Up and down and across the Rangoon river and in the streets and native bazaars there is a never ceasing flow of business. Rice, timber, and oil are exported in large quantities. The river Rangoon is an eastern arm of the Irawaddy delta, the city being situated some 21 miles from its mouth.

The population of Rangoon is about 400,000.

Raphael Santi.

(Pron raf'-ā el) (1483-1520) "Let him be my pupil, he will soon become my master," said the Italian painter Perugino, when he saw the work of the boy Raphael. He spoke the truth, for Raphael became one of the greatest masters of his time, and even today is ranked among the foremost painters of the world.

"He is an innocent angel," Pope Julius II exclaimed, as the beautiful Raphael, his chestnut locks falling upon his shoulders, knelt before him. This was when Raphael, 25 years of age, was beginning the most important work of his life, the execution of those numerous wall paintings which still decorate the halls and chambers of the Vatican, or palace of the Pope, in Rome.

But though princes considered themselves favoured if this young artist even designed a picture for them, and though his students and assistants bowed before him as their sovereign, Raphael always thought of himself as a pupil, learning from the works of other skilled artists how to improve his own art productions and bring them nearer perfection.

In his boyhood days in the studio of his father in Urbino, while he was with Perugino, during the wonderful days in Florence with Leonardo da Vinci and Michelangelo, in Rome at the height of his powers—always he found something which he could learn.

Whether he painted an altar-piece for a church, a great fresco of Bible history or classical

mythology, or made a pattern cartoon for a tapestry, the picture was sure to be beautiful, for Raphael had an instinctive feeling for beauty far beyond that of most men, and the technical genius to put it into paint.

Raphael painted more than a hundred pictures of the "Madonna," or Virgin Mary. Do you know the one called the "Madonna of the Chair"? (See page 2605) It is told that, passing along the street one day, Raphael saw an Italian mother in the picturesque costume of the Roman people, with her baby in her arms. He was struck by the picture she made sitting there

before her doorway, and, seizing the cover of a wine cask near by, he made on it a pencil sketch for this famous painting. The picture is now in the Pitti Gallery, Florence, where there is another famous Raphael, the "Madonna del Gran Duca" (See page 2289).

Raphael died at the early age of 37, but he left an amazing amount of work. The wall paintings which he designed for the Vatican alone might have been the work of a lifetime, but besides these there are hundreds of pictures and studies. And throughout all there is not an expression of the face or a drapery which is not exactly suited to its subject, nor in the thousands of figures which he drew is there an ungraceful line or pose. No artist has ever shown such surpassing

skill in picturing the ideal, the spiritual, the beautiful, as Raphael of Urbino.

To form any adequate idea of the works of Raphael one must visit Rome, but many of the galleries of Europe contain examples of his exquisite art. The National Gallery, London, has the beautiful "Saint Catherine" and the "Ansidei Madonna," among others, while in the Victoria and Albert Museum a special room is devoted to his cartoons for the Vatican decorations. (See Italy, Art)

Raspberry. This favourite fruit (*Rubus idaeus*) grows wild in most parts of Europe, including Great Britain and in northern Africa and parts of Asia. It has been cultivated for several centuries in England, where wild



MASTERPIECE BY RAPHAEL

Raphael's magnificent portrait of Baldassare Castiglione, author of the famous treatise, "The Courtier," now hangs in the Louvre, Paris. Raphael was a most versatile artist and did not confine himself to one branch of art, but excelled equally in portraiture, classical genre, and religious subjects.

RASPBERRY

raspberries are still common in some woodland districts. The ancient Greeks knew it, and its specific name refers to its presence, in their times, on Mt. Ida in Asia Minor.

Raspberry "canes" are planted in the spring or the autumn, two feet apart in rows four feet apart, and supported by wires. The fruit is produced only from canes that are a year old, so that when these have fruited they should be cut right down, three or four young canes being retained for the next season. Numerous pests attack this fruit, of which the worst is the raspberry beetle, whose little grubs run the most luscious dish by their appearance alone. A hybrid between the raspberry and the blackberry produced the loganberry (qv).

Rat. If you were asked to name the most destructive animal in the world, what would you answer? It might never occur to you to name the little rat, the king of destroyers. A distinguished biologist says

"The rat is the worst animal pest in the world. From its home among filth it visits dwellings and store-rooms to pollute and destroy human food. It carries bubonic plague and many other diseases fatal to Man, and has been responsible for more untimely deaths among



RIPE RASPBERRIES

A favourite summer fruit, the raspberry has profited much by careful breeding and cultivation. Here is seen the variety called Perfection, one of the most popular sorts for dessert.

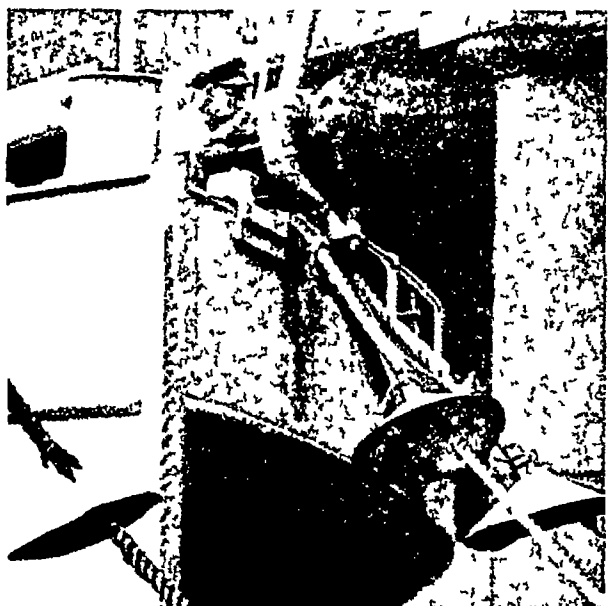
RAT

human beings than all the wars in history. On many a farm, if the grain eaten and wasted by rats and mice could be sold, the proceeds would more than pay all the farmer's taxes. The common brown rat has 6 to 10 families a year, and each family averages 10 in number.

"Rats feed upon all kinds of animal and vegetable matter. The brown rat makes its home in the open field, the hedge-row, and the river bank, as well as in stone walls, piers, and all kinds of buildings. It destroys grains when newly planted, while growing, and in every subsequent stage. It invades store

and warehouse and destroys furs, laces, silks, carpets, leather goods, and groceries. It attacks fruits, vegetables and meats in the markets, and destroys by pollution ten times as much as it actually eats. It destroys eggs and young poultry and eats the eggs and young of song and game birds. It causes disastrous fires, floods houses by gnawing lead water-pipes, and damages foundations, floors, doors and furnishings of dwellings."

Of the two British species, the brown rat (*Rattus norvegicus*) is thought to have come originally from Central Asia and to have reached Great Britain about 1730. The original home



THE BROWN RAT AND HOW IT IS KEPT FROM GOING ABOARD

One of the worst pests of the world is the brown rat, whether it be in the country or the town, for it can go anywhere and eat anything. Our left-hand picture shows you one of these creatures, which has taken its own flashlight photograph by running into a thin wire set across its run. On the right is the device—a kind of shield—used to prevent rats from climbing up mooring ropes and on board ships moored alongside the London wharves.

Photos left I. J. Langford right Fox Photos

RAT

of the black rat (*R. rattus*) was India, from which country it has spread to all parts of the world. It arrived in Europe as early as the 13th century. The black rat is smaller than his brown cousin, but has a longer tail.

When the brown rat reached Britain, it at once began to oust the black species, which is weaker and in all ways less able to look after itself, so that a few years ago it was almost extinct. But now we have killed off the brown rats to a certain extent and the black are breeding rapidly to fill their places, in London the black is once more the commoner species.

Rats do millions of pounds' worth of damage every year, and efforts to wipe them out have largely proved unavailing.

The Story of the Pied Piper

THE little town of Hameln, near Hamburg, was plagued with rats

"They fought the dogs, and killed the cats,
And bit the babies in the cradles,
And ate the cheeses out of the vats,
And licked the soup in the cook's own ladles."

The Mayor and Corporation were having a desperate consultation as to what could be done, when there was a meek tap at the door.

"Come in!" cried the Mayor, and in came a strange figure. He was a tall, thin man, clean shaven, with sharp blue eyes, and was dressed in a long cloak, half of which was red, half yellow. He announced that he was called the Pied Piper, and for a thousand guilders he would charm away their rats.

The Mayor and his aldermen leapt at the suggestion and straightway the Piper went into the street and began to play. Before he had played three notes the rats had begun to come running—rats of all colours and ages and sizes. After the Piper they all ran, following him



A DANGEROUS 'RATTLER'

One of the most poisonous of snakes, the rattlesnake, or "rattler" as he is called in his American home, at least gives warning of his presence. You can see on the tail of this one the series of loose joints which form his "rattle" and tell you to "keep away."

RATTLESNAKE



THE PIED PIPER AND THE RATS

In this drawing you see what happened when the rats followed the sound of the Pied Piper's music. In the words of Robert Browning's poem "they came to the river Weser, where all plunged in and perished."

By permission of George G. Harrap & Co.

through the streets of the town to the river Weser. Into it they all plunged and perished.

But when the Piper demanded his thousand guilders the Mayor laughed at him and offered him a mere fifty. So the Piper played another tune, and while the elders stood, unable to

move, all the children of Hameln came and followed him. He took them to Koppelberg Hill, where a door opened and Piper and all disappeared inside, never to be seen again. One little lame boy alone remained to tell the tale.

Rattlesnake. After all, the rattlesnake is a gentleman outlaw! He rarely strikes without warning, and then in self-defence. A rattle on the tail, which acts as an automatic danger signal, gives him his name.

This rattle is formed of a number of hard, horny, cup-shaped joints, fitting loosely into one another. When the sensitive tail is vibrated, these strike together and give a rattling sound.

Young "rattlers" have only a blunt tip at the end of the tail, formed by a knoblike growth of bone covered with thick skin. When the snake

moults, or sheds its skin, this horny tip is retained and forms the first joint of the rattle. A new joint is added each time the skin is shed, and, as the snake grows larger, each joint is correspondingly larger and so causes the rattle to conform to the tapering shape of the snake.

The rattlesnake can strike effectively only from a coiled position, and then can reach only about two-thirds the length of his body. Usually the snake will sound his rattle and puff and hiss before striking, hoping to drive away the intruder. But when the blow finally falls, it comes with the speed of lightning. The fangs, projecting almost straight out from the wide-open mouth, sink in, driving home their poison. If the poison fails to stop the heart action of the victim, its peculiar quality frequently causes death by gangrene poisoning.

The different species of the group, which belongs entirely to the New World, are all creatures of similar habits. They are not vicious, but rather sluggish, and will slink away unless molested. When cornered, they rattle and puff threateningly, as if to frighten their foe. A rapid movement will provoke them, and then they strike with fury. They feed on rats, mice, and other small rodents. The young are born alive in late summer, and have the full poison equipment at birth.

The worst enemy of the rattlesnake, apart from Man, is the pig. Pigs root the snakes out and make a meal of them, apparently with no bad results from the bite that may be inflicted. This is because the pig's tough skin and layer of fat under it do not allow the poison to enter the blood.

The common rattlesnake, *Crotalus horridus*, found in the eastern United States, is of a bright tawny colour marked with dark brown, and varies in length from three to five feet. It inhabits rocky and wooded places. The diamond rattlesnake, *C. durissus*, of the southern states grows to a length of 8 feet and is often 15 inches round. It is the bulkiest of all venomous snakes. This species lives in swampy places and swims well. Its yellowish body has plainly outlined diamond-shaped black blotches. Some rattlesnakes make their home in the burrows of the prairie-dog, where, unwelcome guests, they ungraciously proceed to feed on the young of their unwilling hosts.

Raven. The raven (*Corvus corax*) has a considerable literary background, for it was the first bird sent from Noah's ark and it was the bird which fed the prophet Elijah. The raven was also the messenger of the Norse god Odin, and its figure was on the flag that the early Northmen (Danes) carried into England. Probably no bird is so widely mentioned in modern literature. The raven Grip is a prominent figure in Dickens's "Barnaby Rudge," and Edgar Allan Poe, in his poem "The Raven," with its oft-repeated refrain of "Nevermore," has immortalized this bird as the symbol of despair.

Ravens are found in almost the whole of Europe, in Africa, northern Asia, and America. They used to be common in Great Britain,

and now, after a period during which they were seldom seen, are becoming once more established in their old haunts, especially in the south-west and in Wales. The plumage of the raven is black with a purple sheen, but its size alone will distinguish it from the crow; the beak is large, thick and very powerful. They are as long-lived as Man, and are, perhaps, the most highly developed of bird forms. Pairs mate for life, and year after year use the same nest, a huge structure of sticks on a cliff or tall tree. They feed on small rodents and will eat the flesh of dead animals even when decayed. The raven's note is a long harsh croak, but the bird



Arthur Brook

RAVEN'S NEST ON A CRAG

Fond of the tallest trees and the most inaccessible crags, the raven is one of our finest birds, but is nowhere common. Notice the huge beak of the parent bird, the uniform blackness of his plumage, and the vast nest—a structure of sticks, several feet thick.

can be taught to imitate sounds and speak a few words. Often this croak, heard far overhead, is the first sign of the bird's presence. In fine weather ravens love to wheel and soar high in the air, tumbling down and playing for hours at a time.

Ravenna, ITALY. This picturesque old city lies in a marshy plain near the Adriatic Sea, 75 miles south of Venice. In the days of the Emperor Augustus Ravenna was a great Roman naval station, but today it is separated from the sea by six miles of marshy ground. The industries consist mainly of wine-making, breeding silkworms, and manufacturing lace.

The city presents a somewhat sombre appearance, as if mourning for its glorious past. The most venerable of the churches is the cathedral of Sant' Orso, which dates back to Roman times, but which has been almost entirely rebuilt. There are 12 other churches

RAVENNA

or "basilicas" in Ravenna originally built between the 5th and 8th centuries, constituting a priceless architectural heritage of early Christianity. Another interesting historical monument is the two storeyed tomb of the great Ostrogothic king Theodoric, dating from about 520, and the tomb of Dante is a square domed building with a relief by Pietro Lombardo.

The battle of Ravenna (1512), one of the fiercest ever fought on Italian soil, is interesting because of the employment of artillery mounted upon carts. In this battle the famous French leader, Gaston de Foix, defeated the superior forces of the Spanish and Papal armies, but was himself killed. The battle is memorable for its curious mingling of trained and specialized armies with the haphazard methods of feudal days.

Ravenna was taken by Theodoric in 492, after a three years' siege, and was the capital of the Exarchate of Ravenna, the last stronghold of the Eastern Emperors of Constantinople in Italy, which was eventually bestowed by Pepin, king of the Franks, upon the Pope. In the later Middle Ages Ravenna was, for a time, an independent republic, and then subject to princely or papal rulers. In 1860 it became part of the kingdom of United Italy. Its population today is 81,000.

Rayon. As late as just before the World War the woman of "Society"

was clearly distinguishable from her humbler sisters by the appearance of her clothes. Today, however, a duchess would pass unnoticed in a crowd of typists, for both wear clothes of the same charming appearance, made from the same fine materials. For a few shillings a girl may buy dresses, underwear and, above all, stockings that only a few years ago would have been beyond her wildest dreams. There has occurred a revolution of outstanding social importance—a revolution which has done much to level the barriers raised by birth and wealth. The girl of but slender means may dress as attractively as the one with a well filled purse, and she studies the Hollywood stars as they pass across the screen, noting every detail of their garb in the hope of being able herself to realize some of the film star's glamour.

This tremendous revolution has been worked not by politicians or agitators, but by the patient

chemist working in the seclusion of his laboratory. He has changed a tree into gleaming cloth. He has clothed rich and poor alike in the luxury formerly associated with silk. Every year whole forests of trees, chiefly spruce, are chipped and ground to make chiffons, velvets, satins, and taffetas of silk-like rayon.

The silkworm gave Man his first idea of making rayon. "Silk is only liquid gum," said Réaumur, the French naturalist, in 1745. "Could not we ourselves make silks with gums and resins?" Many tried to do this, but not until about 150 years later was Count Hilaire de Chardonnet, a French scientist, successful. While helping the famous Pasteur in his study of silkworms, he noticed how silkworms digested their

mulberry leaves into a glue and then forced it out through two tiny holes (spinnerets) to form slender threads which solidified in the air. So he dissolved mulberry leaves with nitric acid, and then imitated the silkworm by forcing the mixture through tiny holes. He found that the cellulose (qv) from tree trunks gave equally good results.

In 1889 Chardonnet built the first factory for making artificial silk. It takes a silkworm four weeks to grow, eat his diet of mulberry leaves, and spin his 1,000 yards of silk fibre, but a single spinning machine can run off a mile and a half of rayon thread in under an hour!

Rayon is often mixed with other textiles to produce cloths that combine strength and silky quality. Interwoven with silk, it makes possible cross dyed and shot effects. The rayon threads take a different colour from the dye than the silk threads, giving the cloth a two toned hue.

Three processes for making rayon have been added to the original method, all based on Chardonnet's discovery. In the Chardonnet or nitro cellulose process purified cellulose is nitrated in a mixture of nitric and sulphuric acids. The resulting nitro cellulose is dissolved in alcohol and ether, yielding collodion. This is forced through the spinnerets, whereupon the alcohol-ether solvent evaporates, leaving threads of dry nitro cellulose. Since these are inflammable and, under certain conditions, even explosive, they are denitrated with sodium hydrosulphide or some similar chemical, which converts the threads back to cellulose again, but



PUTTING THE THREAD IN RAYON

When dissolved in water, treated cellulose turns into a honey-like substance, known as viscose. The photograph above shows how, when this viscose is poured into acid, it solidifies into a continuous thread. This fact forms the basis of the production of rayon thread. Courtesy of Courtauld Ltd.

with those remarkable changes in texture and appearance which make them rayon

In the cupra-ammonium process the raw cellulose is dissolved in a solution of ammoniacal copper oxide, filtered, and forced through spinnerets into a bath of sulphuric acid or caustic soda, which removes the copper and ammonia and hardens the threads. Bemberg rayon is made in this way.

From Acid Bath to Spinnerets

For the acetate or celanese process the cellulose is dissolved in a bath of acetic anhydride, thus producing cellulose acetate. This is precipitated by adding water and the precipitate is washed, dried, and dissolved in acetone. It then passes through spinnerets into a stream of warm air, which dries the thread.

The delicate nozzles of the spinnerets, formerly made of gold and platinum to resist corrosion, are now moulded of porcelain. The nozzle openings vary from .002 to .005 of an inch in diameter.

Wood pulp is the source of cellulose for the viscose process. It reaches the factory in the form of mats. These are steeped in caustic soda to form alkali-cellulose, ground into crumbs, and churned with carbon bisulphide to form cellulose xanthate. Mixed with caustic soda, this becomes viscose, which is forced through tiny openings into an acid bath, where it hardens into filaments. These are twisted into thread, spooled, and reeled into skeins. They are then treated with sodium sulphate, washed, bleached, soaped, and dried.

Among other substances that are made out of the same solutions from which rayon is spun is cellophane, which nowadays is so widely used for wrapping.

Artificial silk is not a good name for rayon, as it is neither artificial nor silk. Silk is a protein, containing nitrogen, rayon is a carbohydrate. Rayon will not wear as long as silk. It cannot stand the rough usage that silk can stand. Its greatest disadvantage is that moisture weakens it. Garments made entirely of rayon must be washed with care to prevent stretching.

On the other hand, rayon does not shrink or become yellow. The threads are so smooth and regular that they do not catch dirt, as silk does. Because rayon does not cling, it is especially cool and suitable for summer wear. Chiefly responsible, however, for the popularity of rayon is its low price.

Silk for the Million

Chardonnet did more than invent a new textile. He changed a luxury into a commodity within the reach of everyone. As mentioned above, he worked a revolution in the life of Woman, and men, too, who have learnt to appreciate the qualities of rayon shirts

and underwear, would hasten to pay their tributes to his genius.

The largest producers of rayon today are the United States, Japan, Great Britain, Germany, and Italy, who together produce about 460,000 tons a year.

Reading. In a book written for a young girl John Ruskin asked a question which meant "Will you stand gossiping with foolish people when you can talk with Shakespeare?"

It is one of the things we can never be thankful enough for, that we can sit down with Shakespeare. Have you ever thought that Alfred the Great or William the Conqueror never read a printed book? The growth of books is a story as wonderful as any that a book has ever told. It must have seemed a marvellous thing in the Long Ago that a man should make marks on stone, and then on the bark of trees, and then on paper, and send his thoughts in such a way to his far-off friends, and then, when the first real printed book came into the world, it must have seemed to the men of that time as if a new wonder had fallen from the sky.

And if the first book had really fallen from the sky, it could not have brought into the world a more wonderful seed than it did contain, for out of that book has come not only a marvellous story, but the whole spreading of knowledge among mankind, the setting free of slaves, the scattering of darkness, the discovery of millions of worlds, the love of justice, the laws of health, and the whole mighty structure of civilization.

Treat Good Books Well

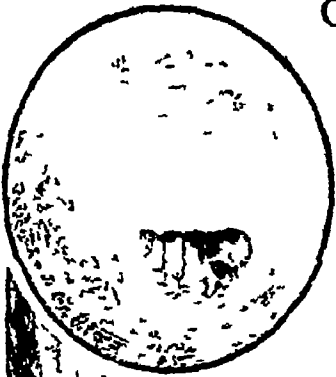
Never throw a good book on the floor, never handle it lightly without thinking. There is something in it that may live for ever, something that will live in the world when the forest from which the paper was made is covered with great cities. That book, perhaps, has in it the thought of a man whom this world knows no more. It may carry on his thought to a child who will come into the world when the age we live in is as far back as the age of ancient Greece and Rome. We should treat good books with reverence.

Now, there are two reasons why we read. The first reason is to gain knowledge, the second is to stir the imagination. They are noble reasons, both of them, for without knowledge nothing worth doing can be done anywhere, and without imagination there is no hope for the future of mankind.

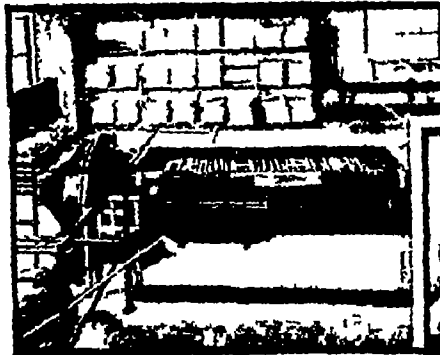
Read, then, the books that hold you as you read them. Healthy excitement is good for us all. We all love thrilling books, tales of mystery that stir us through and through, lifting us up beyond ourselves, out of our little lives, into the world that lies far off beyond

CHEMISTRY MAKES RAYON FROM WOOD

How Man Imitates the Silkworm's Art



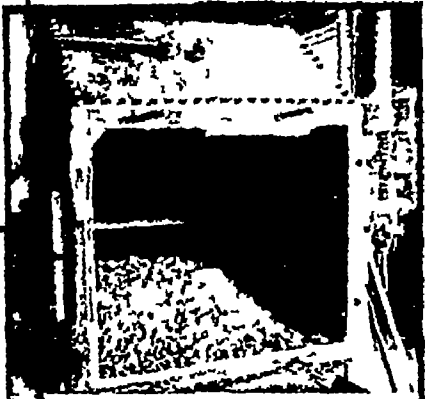
1 Man starts to make silk just as the silkworm does. Both grind up cellulose man using wood the caterpillar eating mulberry leaves.



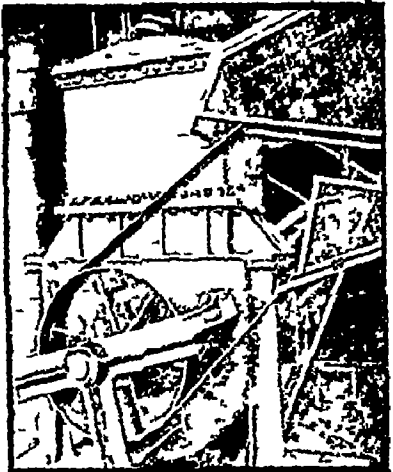
3 Now the mats of alkali-cellulose are ground up into crumbs by shredding machines and allowed to age. A batch of the fluffy snow-white crumbs appears at the right.

4 In the drum at the right the ripened crumbs are churned with carbon bisulphide to form cellulose-xanthate. The xanthate is mixed with caustic soda and comes out as a sticky solution called "viscose".

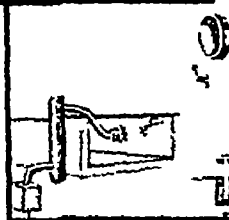
2 The wood pulp reaches the rayon manufacturer in the form of mats (left). These are steeped in caustic soda to form alkali-cellulose, and the excess caustic is squeezed out.



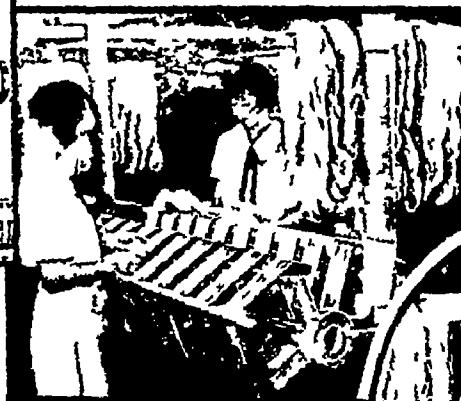
5 In these great spinning machines the viscose is forced through tiny openings into an acid bath where it instantly hardens into filaments. These are twisted into thread and spooled on another machine.



6 The thick, syrupy viscose is being tested by the man above. Skilled chemists are employed to keep their sharp eyes on every step in the manufacture of artificial silk.



7 Sometimes the rayon is spun in pots instead of on bobbins. The 18 or so filaments formed as the viscose comes out of the acid bath are carried up and over a roller and twisted into a single thread as they drop down into a rapidly revolving pot.



8 Next the spools or cakes of the twisted rayon threads go to the reeling machines (above at right) where the thread is reeled into skeins. The reels stop automatically when the required number of yards have been wound, or when any of the threads break. Girls take the completed "flies" off, tie the skeins by hand and hang them on poles. The skeins are now ready to be "finished." They are treated with sodium sulphite, washed, bleached, soaped and dried.

9 The girl at the right is sorting and grading the finished skeins. Keen vision and a delicate sense of touch are needed for this work.



There are four chief rayon processes: the viscose, cellulose, cuprammonium and cellulose acetate. The viscose is the most widely used. The pictures on this page, taken in the largest rayon mill in the United States, show the viscose process.

our reach, yet not beyond our dreams when we are borne on the wings of imagination

But, love the spirit of adventure as we may, the wise reader in this great age of the world will seek his interest in the great realities of the world—in those true stories of our age which are more wonderful and thrilling than all the books of other days. The truth of our own day is stranger than all past fiction.

The world is full of many kinds of people, but there are two kinds of people in the world whose adventures make up stories every day as thrilling as "Robinson Crusoe." There are the men who are working in material things—making engines, or motor-cars, or aeroplanes. And then there are the men who work in things that are not seen—the great kings of science who peer into the invisible, who weigh the earth and measure the stars, and ponder over the mystery of Life itself until they seem to be almost solving it, and then the secret slips away, and men still ask where Life came from, and where it goes, and what it means. Will they find it out one day? The little crystal that the chemist makes—will it one day come alive? Will these men give us longer lives, kill disease, or drive back death?

A wonderful and solemn thing it is to think of these two groups of men, one building up a mighty plan of material things, engines and wheels and wires that seem to encompass all mankind, the other peering behind it all, ever finding something new.

Are these things as interesting as pirates? Are these men fit to be your heroes? Are these mysteries less exciting because the kings of the earth are trying day and night to solve them?

It is only the true book that lives, the book that is true to life, as any made-up tale may be, and we should not waste our time on tales that have no sort of truth in them at all.

A good book, said Milton, is "the precious life-blood of a master-spirit, embalmed and treasured up on purpose to a life beyond life."

Your Books Your Best Friends

Choose your books wisely, as you choose your friends, and you will find in the world no more enduring friends than books. Never be far away from them. In the train, in the field, wherever you are, you may have them with you, at home or abroad they will follow you, the most comforting helpers you can have. You will find one, if you seek it, on any subject in the world, in hope or in perplexity you may seek a friend in books, and at the door of these friends you need never knock in vain. They will tell you all that wise men know, they will admit you to the company of the noblest men and women who have ever lived. The love of books is the key to the realms of gold that are nearer to the Kingdom of Heaven than anything

else on earth. In poetry, in the Bible, in the great books that will never die, a man may reach his heart's desire.

Red Cross Societies. It was the end of a hot, stifling day in June, in the year 1859, at the close of the battle of Solferino. Napoleon III of France, who had led the allied French and Sardinian armies to free northern Italy from the yoke of Austrian supremacy, had won the victory. But such a victory! The carnage made even the victorious Napoleon III welcome peace. Fifteen thousand dead and wounded lay on the field of battle, days passed before the few surgeons could attend to all the wounded, and many perished before help came.



Flag of International Red Cross Society

At this time, a young Swiss, Henri Dunant, happened to be travelling through the battle area, and his heart was rent by the agonizing cries of the wounded. As best he could, he bathed and dressed their wounds, brought water to those burning with fever, and cheered and comforted the sufferers. He gathered a number of women in the neighbouring Italian city into a band of volunteer nurses, who, following his example, ministered to friend and foe alike.

Henri Dunant never forgot the terrible scenes he had witnessed. He wrote a pamphlet describing them so vividly that his appeal moved the hearts of all who read it. He showed how much of this suffering and death could be avoided by an organization to protect the wounded, "without distinction of nationality."

His plea finally resulted in an international conference at Geneva in 1864, at which 14 nations adopted a treaty, known as the "Red Cross Treaty." This was revised in 1906 at The Hague. It provides for the protection in time of war of relief societies to be organized in the various nations. As a compliment to Switzerland, the Swiss flag with its colours reversed—a red cross on a white ground—was adopted as its emblem.

Now, under the Red Cross, the hearts of all nations are united in the service of humanity when suffering comes from flood, fire, pestilence, or war. In every war that has since been waged, this banner of mercy has floated amidst the strife, respected by friend and foe alike.

The most urgent call it had ever received came to the Red Cross at the time of the World War of 1914-18. True to the principle of preparing for the needs of war in time of peace, Red Cross societies in the warring and neutral countries were ready to send corps of nurses, ambulances, and hospital equipment into the fighting districts. Never before had the world seen so terrible a conflict, but never before had

RED CROSS

such a determined and effective effort been made to bring whatever comfort was possible to the fighting and suffering men

The British Red Cross Society was founded in 1870, and was incorporated in 1908. Although the British Army and Navy have medical services of their own, in time of war it becomes necessary to call in further assistance, and this is provided by the Red Cross, which furnishes voluntary aid detachments of workers (known as V A D s) and other helpers, as well as hospitals and hospital equipment. During the War of 1914-18 more than 3,000 of these detachments were formed, and the public subscribed over £20,000,000 for their upkeep.

Blood transfusion, the provision of ambulances, mobile X ray apparatus, first-aid posts on the road, medical work in the Kent hopfields, dressing stations at seaports, and the provision of clinics are some of the services rendered by members of the British Red Cross in peace time.



Fox Photos

RED CROSS IN THE HOP GARDENS

"Prevention is better than cure" is a well known saying. These Red Cross nurses certainly believe in it, here they are seen giving hop pickers' children their daily dose at Yalding, Kent. Where children are congregated together infection is liable to spread, and the mothers certainly appreciate this medical supervision.

The Red Cross is not, strictly speaking, an international society. Each of the 54 national organizations is independent, but there is an International Committee at Geneva by which the various societies are linked.

BRAVES & SQUAWS of REDSKIN TRIBES

Lovers of Redskin stories and "cowboy and Indian" tales—and who does not love those romantic yarns?—will find much to interest them in this account of the history and the customs of a noble race.

Red Indians. When, on October 12, 1492, Columbus first landed in the New World, he found himself among strange looking people,



Red Indian Totem Pole

with bronze or copper coloured skins and lank black hair. In his letter to the king of Spain telling of the land, Columbus called these natives *Indios*, because he thought he had reached India. This mistake of Columbus has been handed down to the present day, for we still call these people "Indians," though we may add the word American to differenti-

ate them from the natives of the real India, which lies on the other side of the world. More usually we call them Red Indians or redskins, though

really there is not so much red in their faces as there is in the pink-cheeked faces of white men.

When men found that these people were not natives of the real India, they began to wonder whence they came. Some said that they were the lost ten tribes of Israel, others, that they came from central Asia. This last may be true, for the Indians resemble the Mongolians of Asia. Their eyes have a slight slant, though not so much as those of the Chinese, they have high cheek-bones, and their hair is black as is that of the eastern Asiatic peoples. Besides, the northern tribes of Asia are Eskimo, who are also found scattered over northern America (See Eskimos). But if the Indians came from Asia, they must have come centuries before Columbus, or even before Leif Ericson and his Northmen discovered America.

It is hard to describe the American Indians and the way they lived, for there were many different tribes, just as there are many different nationalities among the white race, and their



RED INDIAN ARCHITECTURE AT ITS BEST

Although most tribes contented themselves with shelters made of grass or skins, some were quite advanced. This log house, built by the Creek Indians in the latter part of the 18th century, compared favourably with the houses erected later by the white settlers in the same territory. The tribes of the north Pacific coast of America also built log or plank houses.

appearance and ways of life and their languages were different. The Sioux, the Algonquins, the Mohicans, the Blackfeet, and the Iroquois are a few of the tribes with whose names we are familiar, chiefly from the writings of Fenimore Cooper, but there are many more.

The white settlers on the Atlantic seaboard first came into contact with the Indians of the eastern wooded area, who roamed over all the land on both sides of the Great Lakes from the Mississippi River to the Atlantic Ocean. They numbered several hundred tribes, and spoke many different languages, but all lived in the great forests and had some what similar traits and customs. They practised agriculture to some extent, and used wild rice, but depended largely upon the chase for their existence.

They were divided into totemic clans, that is, clans which considered themselves specially connected or related with a certain totem animal. Their totem—it might be a wolf or an owl—was often carved upon huge wooden totem-poles. This part of their organization has been copied by the Boy Scouts of today.

The Indians that the Puritans met in the Massachusetts wilderness were like others of the race, of a coppery or reddish-brown colour. They had abundant long, straight, black hair

and high cheek-bones. The Puritans did not like their red-face neighbours very much. They distrusted a person who would not fight in the open. Yet to the Red Indian craftiness was a mark of superiority. He considered it only a matter of strength to kill an enemy in the open, but to steal upon him and kill him from ambush showed skill.

But though the Indian was a bad enemy, he was a good friend. His generosity in furnishing the colonists with maize sometimes saved them from starvation, and his instruction in planting maize and fertilizing it with fish-waste enabled his pale-face brothers to feed themselves. The warning of a friendly Indian at times saved the Puritans from massacre by hostile braves.

A well-known case is that of Pocahontas, an Indian princess, daughter of a chief of the Virginian tribes. At the age of 12 Pocahontas saved the life of Captain John Smith, who had been captured by Indians. They were about to club out his brains when (so the story goes) the girl "got his head in her arms and laid her own upon his to save him from death." She later married a Virginian settler and returned with him to England. She died there in 1617, and lies buried at Gravesend, far from her country and her people.



RED INDIAN SUGAR BASKET

Minnesota Indians packed maple sugar in well-sewn birch-bark baskets. Maple-sugar making was invented by the Indians.

REDSKINS OF AMERICA'S PLAINS AND WOODLANDS



This picture tells many things about the culture of the tribes in the eastern part of the United States and Canada. They built dome-shaped bark wigwams and birch-bark canoes, they were hunters and farmers, they ground their corn with a mortar and pestle and they wove baskets and rugs and made pottery. The youngest member of the family was hung from a tree trunk in his cradle while his mother worked. When the mother wished to carry her baby about she fastened him to her back cradle and all



Unlike the Indians of the eastern woodlands these Plains Indians ranged far and wide in pursuit of the buffalo, which furnished them food, shelter, and clothing. So as you see they did not live in permanent houses but in tents or teepees covered with buffalo hides, which could be quickly taken down and moved. In the far distance you see hunters riding toward a herd of buffalo. The mounted brave in the foreground is starting to join them while the woman at his left is scraping a hide.

RED INDIANS

When the whites first came to America more than 200 languages were spoken north of Mexico, and the number of dialects ran beyond a thousand. The settlers could learn an Indian language only by talking to the redmen, for none of the tribes they met had any form of writing, and no tribe anywhere in America had more than a crude picture writing. Figured wampum belts were often used to help the redmen to remember the details of treaties or important events. In every tribe there were legends and tales, some more fanciful than true, of the history of the tribe. When the day's work was done, and



MODERN SEMINOLES

Bright striped costumes are a characteristic garb of the Seminole Indians of the Florida swamps. This small band of a few hundred has never been conquered and still holds aloof from the white man.

all were gathered around the camp-fire, the old men and old women would tell these tales. A good idea of the life of the Indians, and of their legends, may be formed from Longfellow's famous poem, "The Song of Hiawatha."

The women or "squaws" did what seems to us the hardest work. They planted the squashes—a kind of vegetable marrow—and the maize and beans from which they made succotash, an Indian dish. They dressed the skins of the animals and made the clothes for the family. They cooked the meat on sharp sticks over the fire. They looked after the children. Until the papoose (baby) was a year old they carried him on their backs or hung the cradle on a tree while they did their work. When the

family wigwam was moved it was the squaws who carried the burdens and set up the camp again in its new place, and built the camp-fire—which was not an easy task when we remember that the Indian had neither matches nor flint nor steel, but had to make fire by rubbing pieces of dry wood together.

But the women were not mere drudges. They had a voice in deciding important questions, and among the Iroquois the braves could not go on the war-path without the consent of the women.

The houses were the property of the women, and woe to the brave who did not bring home

deer enough to feed the family, or to the man who showed himself a coward on the war-path. He would probably be told by his squaw there was no room for him in her wigwam, and he had better go back to his mother. So you will see that among the American Indians the women were, as a general rule, very important persons, and they kept an extremely firm hand on their men.

That brings us to the work of the men. They had to hunt and make war. But hunting was not done for amusement. It was to get something for the family to eat, for most of the food was gained by hunting and fishing.

The Indian brave never seemed to tire of war. There was probably never a time when numerous conflicts were not taking place in some parts of the continent. The redmen went to war if another tribe encroached upon their hunting grounds, or if a member of their tribe had been killed by a band from another, or sometimes apparently only for excitement.

A brave, wishing to distinguish himself, and perhaps to win the favour of some Indian beauty, would announce that he was going against an enemy and ask others to join him, and so the conflict would begin. However it arose, Indian warfare was carried on with all the cunning and cruelty of which the Indians were capable. If possible, they fell upon the enemy unawares and massacred men, women, and children, each



'SWEAT HUT' OF THE SIWASH TRIBE

The Siwash still cling to the primitive custom of using the sweat hut in the treatment of smallpox and pneumonia. Hot stones are placed in the hut, which is covered to make it air-tight. The patient enters the hut and remains in it until he is drenched in perspiration. He then rushes out and plunges into a very cold stream.



SIoux CHIEFTAIN AND HIS SQUAW

The Sioux are an American Indian tribe who call themselves Dakotas. Sioux is the termination of the French form of their Ojibwa name and is used for the Siouan family, comprising many tribes in the Mississippi and Missouri basins. Pride of race is plainly writ in the stern features of this Sioux chieftain and his squaw beside him.



Brown Bros

LOVELY RED INDIAN MAIDEN

This brown-skinned, black-haired girl, clad in home-made but highly decorative garb of beaded cloth and leather, is one of the Ojibwa tribe of the great Algonquian stock. Although termed "red," the American Indians are only so when they assume their war-paint. Their general colour is brown, very little darker than the skin of a Japanese.



INITIATING MEDICINE-MEN AMONGST THE WINNEBAGO REDSKINS

The medicine-men formed a sort of secret society, the older members of which initiated the younger ones in the principles of their art. The candidates, who have fasted for several days, are seated at the far end of the long hut. Each old medicine-man, carrying his medicine bag, then parades about the hut, making a speech as he goes. After each one has spoken, all crowd at one end of the hut and advance upon the candidates, knocking them over with medicine-bags. When the candidates rise there is a ceremonial feast and dance, after which they are fully fledged medicine men. Serving as both priest and doctor, the medicine-man used magic, prayer, force of suggestion, and a multitude of symbolic means, as well as actual medicine, usually made from roots. He always brought his sacred rattle and his sacred medicine-bag to a patient's bedside. In every tribe there were men, and some times women, who were regarded as possessing supernatural powers by which they could cure disease.

brave anxious to take as many scalps as possible. Or they might take a few prisoners back to their village to torture them with fiendish delight. Occasionally, however, a few boys or young men were adopted into the tribe to take the place vacated by sons or brothers or husbands who had fallen in battle.

In a Redskin Village of Huts

Because his enemy tried to surprise him, the Indian fortified his village. The Indians that the Puritans knew lived in villages of wooden huts for at least a part of the year. The Iroquois lived in long wooden or bark houses with a passage down the middle. The Algonquin were smaller than the Iroquois homes, and around a whole group of them was a high stockade.

But whether large or small, all of these houses were so full of smoke and so dirty that it must have been a welcome relief in the summer to live in the more open wigwams. These were simply constructed of poles fastened together at the top, with skins or matting made of rushes spread over the poles. It was in a tepee made like this and covered with buffalo skins that the Indians of the Plains lived all the time, and as the eastern Indians were pushed back from their old homes, they too adopted this fashion.

But though the homes were dirty ones, they were not unhappy ones. All listened eagerly

to the tales of the story-tellers. They delighted in all sorts of games of chance, for the Indians were born gamblers. Yet whether winning or losing they never lost their good nature, laughing just as heartily when beaten as when victorious.

The boys had their ball games, they flew their kites of fish-bladders, spun their teetotums, and played at hide and seek and blind-man's-buff. The game of lacrosse was borrowed from the Indians, who in the old days used to play it with sides 800 strong, and with the goals half a mile apart. (See Lacrosse). The girls, though brought up to work long and hard and to perform difficult tasks, amused themselves with strange looking dolls in such leisure hours as they had. Both boys and girls made mud pies.

What the Red Indians Wore

Their clothes were made from skins dressed until they were very soft. For trimming, dyed porcupine quills, beads, and buckskin fringes were used. Boys' and men's clothes were trimmed as much as women's. Down the side of their leggings ran buckskin fringes. Beads adorned their soft deerskin moccasins and their buckskin jackets or shirts, and around their necks were necklaces of elk teeth, badger claws or bear claws. The women's short full skirts and jackets were also of buckskin and fringed about the bottom. The blankets which the

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men wore were usually made of soft tanned animal hides

The dances in which the Indians engaged usually were not for amusement, but were a religious ceremonial, or for some magical purpose. The war dance, in which the men were painted as if for war, was intended to bring them victory. The scalp dance was in celebration of victory. The buffalo dance of the Plains Indians was to compel the coming of herds of that animal. The sun dance followed several days of fasting and prayer, and the snake dance was but a small part of a nine days' ceremonial.

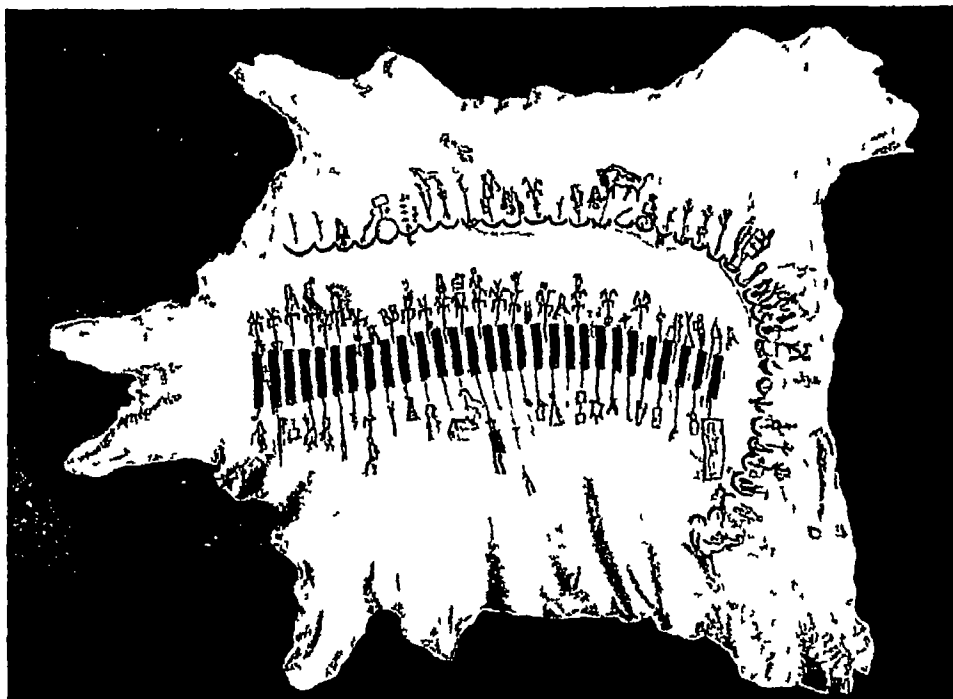
The Indian had very complicated religious observances. Besides the Great Spirit, he

improve the savage Indian. At first he regarded the pale-face with awe, thinking him descended from the "Great White Manitou" or spirit. When he discovered that the white man was no supernatural being, he welcomed him as a brother. For a few glass beads, some bright red cloth or other trifle which took his eye, he was willing to share his fields with his pale-face brother. He was accustomed to sharing things, for the possessions of the Indians are the common property of the tribe or family.

From Friend into Enemy

When he found that this pale-face brother intended to keep the land for his own use, and shut the Indian out of his hunting-ground,

he became angry. Instead of being a brother he became an enemy. Even when the white man was friendly the Indian was suspicious. And as he was driven farther back into the continent, and saw that the white people had come to stay, he became more and more bitter. From 1637 until 1876 there were frequent conflicts between the Indians and the ever-advancing white settlers, but for long now the "armed resistance" of the tribes has ceased.



AN INDIAN METHOD OF RECKONING PAST TIME

In this Kiowa buckskin calendar the lunar months from August, 1889, to July, 1892, are represented by the crescents, while the black oblong marks indicate the winters, and the white spaces between them the summers, of the years 1865 to 1892. The drawings represent events. The building below the winter of 1875 is Fort Sill, where Kiowa Indian prisoners were brought that year.

believed in many other spirits, some good and some bad. The spirits were all about him, in plants and trees and rustling leaves, they were in the wind and cloud and rain, they were in the mountain and in the brook. It was spirits that caused trouble, suffering and death. When a man was ill some bad spirit had entered into him. So the Indian had his medicine-men who knew how to gain power over these spirits and drive them away. By muttering magic words, by tricks and by screaming and making a loud noise these medicine-men were supposed to overcome the evil spirit. But the pale-faces found that the medicine-men knew, too, the healing qualities of many herbs and roots which they used along with their charms.

Such were the Indians that the white men found. But contact with the whites did not

bloods are concerned. When the white men first tried to force them to adopt a civilized way of living, many Indians contracted tuberculosis. Many others died of measles and other diseases from which they had not suffered before the coming of the white man. It is probable that at the time of the discovery of America there were about 850,000 in the United States and 200,000 in Canada. In 1930, there were 332,397 in the United States and about 115,000 in Canada, of various degrees of admixture. Probably not more than half these are of pure Indian blood. The most populous tribe are the Navajos, who number about 40,000. Another comprises the Pueblo Indians (*qv*), who are, however, of a different type.

No doubt the picturesque Indian has disappeared to a large extent. In this sense the

RED INDIANS

redmen are a "vanishing race" But they have left their traces behind them Along their forest trails are built the great railways of the country At the posts where they brought their furs to the early traders large cities have sprung up And Indian names dot the map of the U S A from Massachusetts to California The United States Government has for many

years concentrated the Indians on reservations wherein they lived in tribes There are similar reservations in Canada, where the Red Indians are on the increase Their education and health are a particular interest of the Canadian Government, who will usually grant full citizenship to those Indians who wish to leave the reservation for the wider world



LITTLE EAGLE-HEART *and His Sister* LAUGHING-WATER

English, and go to school But their faces are the same as those Columbus saw

THERE was once an American boy who was tall and straight and slender His eyes were as black as ink his hair as black as a crow's wing He could run like a deer, swim like a fish and climb like a squirrel He was as solemn as a little owl When he grew to be a man he wore a headdress of eagle feathers His skin was not white It was very nearly the colour of an English penny Now you know what he was He was an American Indian There are still a great many such Indians Most of them live in houses, or on farms They dress like white boys, speak

English, and go to school But their faces are the same as those Columbus saw It was a hard, wild life the Indian boy lived Still, he had a good deal of fun It was like camping out all the time There were about a million Indians, and the country was so big that there was room for everybody to move about a good deal There were no cities or farms, no railway trains or wagons, no horses even or cattle Dogs were their only tamed animals The Indians had to travel on foot They followed narrow paths, or trails, through the forests and over the plains On the rivers and lakes they made long journeys, in boats so light that they could carry them on their shoulders from one stream to another These boats, called canoes, were made of birch bark stretched over frames of wood A great many Indians travelled together, for company and for safety Each band was called a tribe and each had a chief When a tribe found a good place to camp, the tent poles were stuck in the ground in a circle The top ends of these poles were tied together Then the skins of wild animals, or mats woven of rushes, were fastened over the poles They called this tent a wigwam Some Indians build dome shaped wigwams, like tents Others build long houses of bark, big enough to shelter many persons



Eagle-Heart learned the "moose call" that brought the big bull moose within range of his swift arrow

Our little Indian boy was born in a wigwam in a village of other wigwams in the forest His mother put a long shirt of soft yellow

RED INDIANS

deer-skin on him and taught him his first lesson before he was a day old. She taught him that he must not cry. When he cried she put her hand over his mouth. She did this because cruel enemies and wild animals might hear his cry. When he grew up he could bear almost any pain without complaining.

The Indian baby could not even kick. His mother bound him to a flat piece of birch bark, to make his back and legs straight. She hung "the baby and cradle and all" from her shoulders. She wrapped a big skin around herself and the baby if it were cold weather, leaving his face uncovered so that he could see. When the tribe stopped to rest, the baby and his cradle were hung from the limb of a tree, and the wind rocked him to sleep.

Someone was always saying "don't" to the Indian boy and girl. "Don't

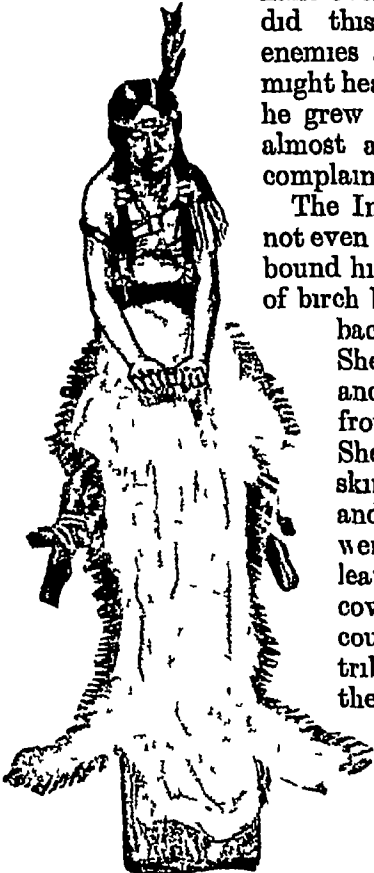
"Laughing-Water had to help to scrape the hair from deer-skins with sharp clam shells, and rub and pull the skin until it was as soft as a kid glove."

make a noise when you walk. You must not even rustle a leaf, or snap a twig." That might scare away the deer their father was trying to kill, and then the family would go hungry. Sometimes, when out hunting, a boy had to lie for an hour as quiet as pussy at a mouse hole. The Indian boy had to learn to make fire by twisting a pointed stick rapidly in a groove in another stick. He had to learn to make a strong bow and a stone arrow-head, to make a canoe and snow-shoes. He shot arrows at a mark every day, he speared fish, and learned to use a stone hatchet called a "tomahawk." He had to be able to tell what kind of weather was coming, and know the ways and places and calls of animals and birds, and be able to follow the tracks of men and wild beasts. He had to learn how to fight, too, or he and his family would be killed. The Indian boy was grown to a man before he had learned all his lessons.

One sign that he had grown up was that he was given a name. It was really a nickname, given for something he had done. This name he had to bear all his life, so he was very careful not to do anything foolish or cowardly. If he did something brave, and got such a name as Eagle-Heart, he was pleased. The Indian man was always proud and brave and cunning.

If Eagle-Heart's sister was a merry little maid she might be called Laughing-Water. Laughing-Water had lessons to learn, too. She had to help her mother to take the skins from the wild animals the hunters brought home, and cut up and cook the meat. She had to help to scrape the hair from deer-skins with sharp clam shells, and rub and pull the skin until it was as soft as a kid glove. A needle she made of a fish bone, for thread she used the leg tendons of the deer. Her thread was like our violin strings. It was very strong. Then she sewed the skins into shirts and leggings and moccasins and robes. She embroidered moccasins and belts with little shells, after boring holes through them, and she coloured porcupine quills and arranged them in patterns on the soft yellow skin. She coloured long eagle feathers and made a warrior headdress for her father. She made herself necklaces of shells.

In the summer the Indian women and girls dug holes in the fields, with pointed sticks or clam shells, and planted maize and beans, pumpkins and tobacco. Laughing-Water had to gather the ripe maize, shell it, boil the grains in clay pots, dry them and pound them to meal in wooden bowls.



She sifted the meal through a sieve she made of fine tough grass. She wove baskets of reeds and grasses. If she had time she wove coloured figures and lines in her pretty baskets. She made clay cooking-pots and water jars, and she painted figures on them. One thing she loved to make was candy. She made it by boiling the sweet sap of the maple tree. For her father, Laughing-Water dried the broad tobacco leaves. He put these in a pipe with a stone bowl and a hollow reed stem, and smoked them.

In the evening the whole tribe sat round a big fire under the maple trees. The tired hunter smoked and talked of the hunt or of battles, and old men and women told stories of long ago.

Red Sea. Travellers from Europe through the Suez Canal to India or other countries on the opposite side of the globe usually find the Red Sea the most uncomfortable part of their voyage. For this little basin, only 1,200 miles long from the Isthmus of Suez to the Strait of Bab el Mandeb, and from 100 to 250 miles wide (except at the Strait, where it narrows to 15 or 20 miles), is so hemmed in that the air above is always saturated with moisture, and a tropical sun beating down from cloudless skies makes the air hot as well as damp. On the east lies Arabia, a narrow sandy strip of coast backed by a limestone range, and on the west lies Africa, with the wide sandy plains of Egypt in the

north, rising into the high table-land of Nubia and the mountains of Abyssinia farther south.

The Red Sea has been from early times a great highway for the trading peoples of Mediterranean lands—Egyptians, Phoenicians, and Arabs, and, in the Middle Ages, the Venetians. After Vasco da Gama's discovery of the route round the Cape of Good Hope in 1498, most traffic went that way for the next 370 years. The opening of the Suez Canal in 1869 restored prosperity to the Red Sea, and now nearly all shipping for India and the Far East passes this way. (See Suez Canal)

The Red Sea occupies a long trench or valley caused by the subsiding of the earth's crust. It is fairly deep (except in the Gulf of Suez), averaging about 1,500 feet. The Sinai peninsula lies at the northern end, between the narrow Gulf of Suez and the Gulf of Akaba. It is at the northern end of the Gulf of Suez that the Israelites are believed by some scholars to have made their miraculous crossing.

Both shores of the Red Sea are lined with coral reefs and coral islands, and the pilot's chief danger lies in these hidden reefs, upon which the sea never breaks owing to their porous formation. The Red Sea is also subject to sudden squalls, making navigation difficult for sailing boats. The red colour of the water is attributed to tiny forms of algae.

MEN *who* MADE the REFORMATION

The most stupendous revolution in the history of the Christian Church is described in this article. We learn of the men and measures that figured in the Reformation, and the origin of the name "Protestants."

Reformation, THE How stupendous were the changes wrought, how manifold the causes, and how memorable the figures in the crowded scene of this great drama of the 16th century—the Reformation—which stands at the threshold of modern history!

At the centre of the movement we behold Luther (*qv*), the Saxon monk with flashing eyes. His Renaissance forerunners stand near by—the scholarly Erasmus, who, through his edition of the New Testament and the Church "Fathers," stimulated research into the organization and teachings of the early Church, and Reuchlin, who first led Christian men to the study of Hebrew.

In the background we dimly see the spiritual mystics of the later Middle Ages—Tauler of Strasbourg, the "Friends of God," and the "Brethren of the Common Life"—whose teachings of "heart religion" came to Luther in part through his monastic superior Staupitz, and helped to lead him to his doctrine of "justification by faith." By Luther's side we behold the large head and insignificant body of Melancthon, his colleague in the University of

Wittenberg, who became the chief theologian of the German Reformation.

About these central figures are grouped Ulrich von Hutten, the humanist knight, afire with German patriotism, Tetzel, the "indulgence preacher," who caused the outburst, the Emperor Charles V, burdened from boyhood with the cares of many kingdoms, desirous of an orderly Church reform, but resolved that Luther should "never make a heretic of him," and distracted from the suppression of the German revolt by wars with France over Italy and his fluctuating negotiations with the Pope.

In outlying parts of the picture we see the contemporary reformers of other lands—Le Fèvre of France and Zwingli of Switzerland, who arrived independently by way of humanism at similar views as Luther's concerning indulgences and justification by faith, John Colet, who worked in England for Catholic reform such as was desired by Erasmus and Charles V, John Calvin, who made Geneva the world centre of Puritanism, and Loyola (*qv*), soldier and monk, whose "Society of Jesus" (Jesuits) became the chief agency of the Catholic



FAMOUS CHARACTERS OF THE REFORMATION AND THE RENAISSANCE

On this crowded canvas the artist, Wilhelm von Kaulbach, has brought together the chief actors in the great drama of the New Age, many of whom never met in actual life. On the platform at the rear Luther holds aloft the Bible, while around him cluster other theologians of the period. Against the two pillars to the right and left stand the two great monarchs who championed the Protestant cause, Gustavus Adolphus of Sweden and Elizabeth of England. In the right alcove Gutenberg, with Renaissance artists at his side, holds up a printed sheet. In the left alcove Copernicus, Galileo, and others expound the new astronomy. In the left foreground, geographers and discoverers hover over the globe to which Columbus has recently given a new continent. Hans Sachs, the shoemaker poet, sits in the centre of the foreground. In the distance behind him is a group clasping hands over the religious Peace of Augsburg. A little nearer and to the right sits Shakespeare listening to laurel-crowned Petrarch, behind them are Erasmus and Reuchlin. In the right corner are fragments of Greek and Roman art which the Renaissance had taught men to venerate.

Reformation in stopping the further progress of Protestantism. Surely no period in history is richer in striking figures and memorable scenes than this!

The causes of the movement in Germany included a growing dissatisfaction at recognized abuses in the Church, the broadening of men's minds through the revival of learning and the discovery of the New World (see Renaissance), and a deep-seated feeling of social and economic discontent, which broke out in 1525 in a widespread Peasants' Revolt against their masters—put down with fierce cruelty by the German princes, urged on by Luther. The growing national spirit of Germany added a political element, for it deeply resented the money sent each year to Rome for various papal taxes.

All these forces of discontent with the old order rallied round Luther in the early years after 1517 and gave him their support. Princes, German patriots, Church reformers, men of the New Learning, knights, and peasants each thought he was their especial leader. Gradually they saw that this monk was not the voice of any special interest or group, and many drifted away into indifference or opposition by 1525, but by that time the movement had passed beyond control—even beyond the control of Luther. His denunciation in 1517 of the abuses of indulgences had resulted in a violent political, economic, social, and religious revolt.

Luther's opinions developed rapidly in the months of controversy. He rejected the headship of the Pope, denied that priests have

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any power that laymen do not possess, and declared that the vows taken by monks and nuns were not binding and that monasteries should be abolished. He rejected the celibacy of the clergy and all but two of the seven sacraments—the Lord's Supper (Eucharist) and baptism—and profoundly modified at the same time the teaching concerning the Eucharist.

By 1521 he was definitely a rebel against the Pope and the Church. Only the facts that Germany was not a strong centralized monarchy but a loose federation of states, and that the head of Luther's own state—the Elector Frederick of Saxony—insisted on fair play for this Saxon university professor, prevented the Lutherans from being crushed in the beginning by the Pope and the Emperor, Charles V.

Events of Outstanding Importance

The chief landmarks of the Reformation, so far as it relates to Germany, were these: Luther's posting of his Ninety-five Theses against indulgences (1517), his burning of the Pope's Bull and the books of the canon law (1520), his appearance and condemnation at the Diet of Worms (1521), the Peasants' Revolt (1525), the Diet of Spire (1529), which decreed that religious changes should cease and the rights of the Catholic Church be restored, the protest against this decree (whence comes the term "Protestant"), signed by the Lutheran minority in the Diet, the five wars (1521 to 1556) waged with France by Charles V over Italy, his hostile relations at times with the Pope, and the advance of the Turks to Germany's doors through the conquest of Hungary (1526)—all of which hindered the Emperor's free dealing with the Lutherans, the adoption of the "Augsburg Confession," setting forth the Lutheran faith (1530), the Schmalkaldic War (1546-47), in which the Protestant forces were defeated by those of the Emperor, largely through the defection of the Lutheran Maurice of Saxony, the religious Peace of Augsburg (1555), by which the Emperor was at last forced to grant to the ruler of each German state the

right to choose between Catholicism and Lutheranism. For more than a half century this treaty gave to Germany religious peace (*See Thirty Years' War*).

The Lutheran Faith established itself chiefly in northern Germany and Scandinavia. The Swiss, French, and Dutch movements drew their direct inspiration from a similar movement launched by John Calvin a generation later—a movement which inspired Scotland through John Knox (*See Calvin, Knox*).

The English Reformation had its beginning at the time when Henry VIII broke with the Pope in 1534, chiefly because of his reluctance to allow the King to divorce his wife, Catherine of Aragon, so as to be able to marry Anne Boleyn (*see Henry, Kings of England*), but the introduction of Protestant doctrine into England did not come until the reign of Edward VI. There was a Catholic reaction under Mary I, who clung to the old faith, but under Elizabeth the new Church of England was firmly established.

At the beginning of the Reformation the authorities of the Roman Church did not realize the extent of the danger which threatened it. When they saw the revolt spreading into country after country, and taking so firm a hold on the minds both of rulers and people, their eyes were opened and they proceeded with zeal and energy to repair the breaches that had been made. The Society of Jesus, founded by Ignatius Loyola in 1540, supplied an army of



GENEVA'S 'WALL OF THE REFORMATION'

This lovely monument, erected by public subscription in Geneva, reminds the beholder that the Swiss city was a staunch citadel of the Reformation during the 16th and 17th centuries. The huge central figures are those of Calvin, Farel, Beza and John Knox. The smaller statues are of Boscay, Cromwell, Roger Williams, William the Silent, Coligny and the Elector of Brandenburg. The central figures are the work of Paul Landowsky and Henri Bouchard.

enthusiasts whose policy and devotion proved invaluable. By the decrees of the Council of Trent (1547-63) the Church corrected many of the abuses complained of and reaffirmed its ancient doctrines and traditions. A succession of able Popes during the latter half of the 16th century then followed the policy marked out for them by this Counter-Reformation, and thus removed the incentive to revolt in lands that were still loyal.

Thus the middle of the 16th century saw the tide of the revolution checked. By the close of



CARCASSES IN COLD STORAGE

Most large cities contain blocks of buildings known as "cold stores," owned either by individual firms or by companies, who hire out space. Above is a bay on the storage floor of the Blackfriars Cold Stores, London. The walls of these buildings are packed with non-conducting material, so that heat shall not penetrate from outside.

(Photo Sydney H. Newbery)

that century Europe was divided between the two forms of Christianity by almost the same lines as exist at the present day. (See related articles Charles V, Loyola, Luther, Wycliffe)

Refrigeration AND COLD STORAGE Artificial cold, or refrigeration, is almost as important as fuel in our complex modern life. Not only does it supply us with refreshing cold foods and drinks in summer, but it cools our theatres and other large public buildings, and preserves our foods in the home, in warehouses, and in transportation. Furs are frequently kept during the summer in cold storage, and huge refrigeration plants are used to make and maintain the ice on skating rinks.

In 1834 a machine was produced, from the design of Jacob Perkins, which was the germ of the modern refrigerator. Some twenty years later appeared the Harrison refrigerator, on the same principle as Perkins's, but greatly improved, and from that time the science of

refrigeration progressed by leaps and bounds. It was in 1879 that the first cargo of beef chilled by refrigerating machinery was shipped from America, and the first satisfactory cargo of frozen mutton arrived from Australia.

Although some cold-storage plants still use natural ice, mechanical refrigeration, or the production of cold without ice, has been almost universally adopted since about 1890. Refrigeration by this means gives lower temperatures, permits the regulation of the temperature as desired, and in many cases is cheaper than natural ice. Mechanical refrigeration is also used for making ice artificially.

How 'Cold Stores' Work

In a modern cold-storage plant the air is kept moving by fans, so that the cold air is carried to every corner. In rooms used for keeping fruits and other foods, ventilation is provided, while in other rooms the air is kept pure and dry by the use of absorbing chemicals, such as lime or calcium chloride. Large recording thermometers with pencils which move over dials as large as the face of a clock are sometimes used to keep hourly records of the temperature.

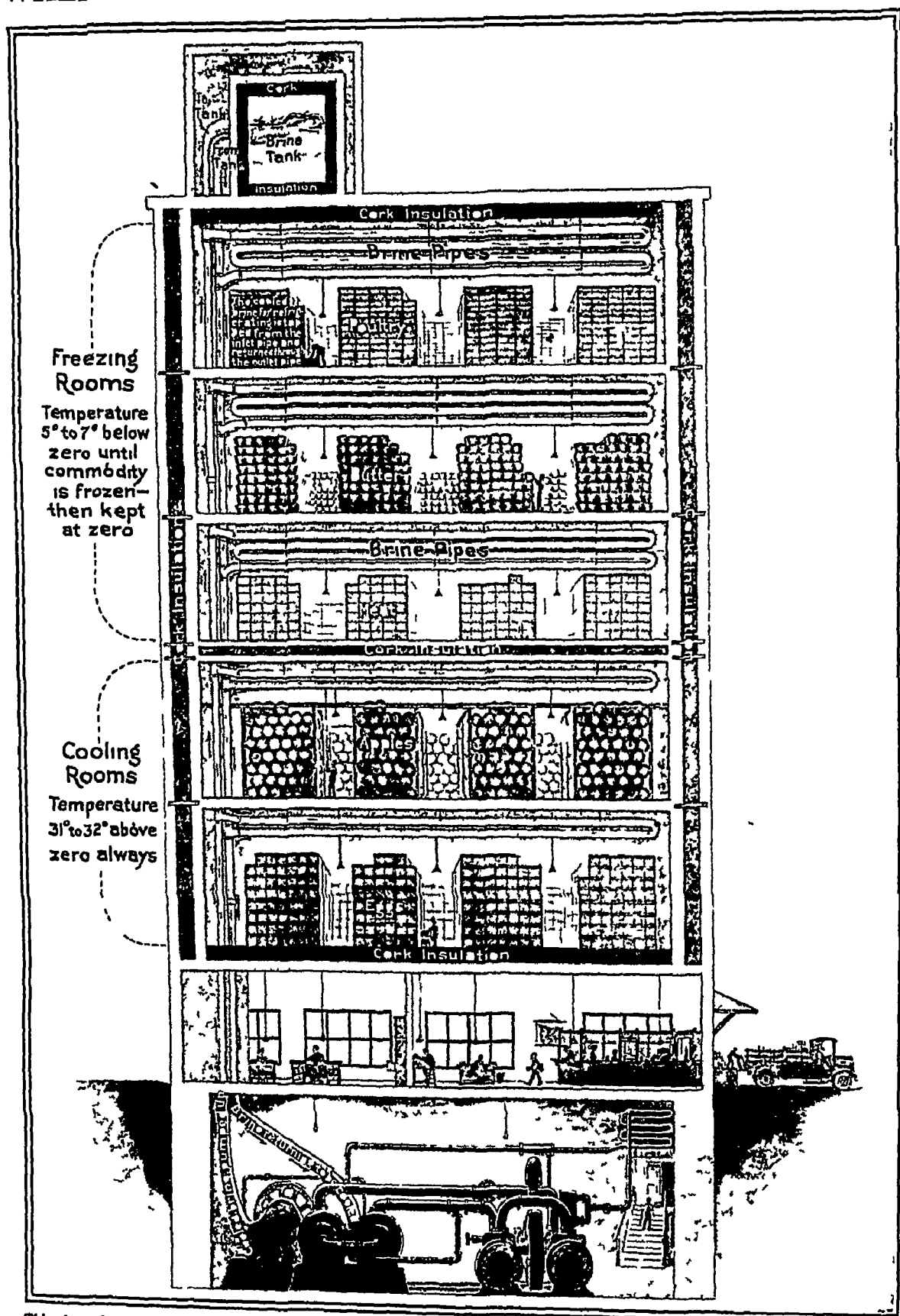
Cold can be artificially produced by the liquefaction of a solid, by the vaporization of a liquid, or by the expansion of a gas, as we know, the liquefying solid, the evaporating liquid, and

the expanding gas all cool their surroundings by absorbing heat from them. (See Evaporation, Freezing) All three principles have been employed in artificial refrigeration. Of the gases employed to produce cold by rapid evaporation after compression into liquid, the most widely used is ammonia vapour.

The Refrigerator in the Home

In a household refrigerator gas is condensed to liquid in a condenser coil below the chamber where food is kept. The liquefied gas is led up through a tube to a cooling unit in the "food safe," where a float valve regulates the amount admitted. The expansion of the liquid to a gas makes the coils very cold by extracting heat from the surroundings. The cooling unit therefore acts like a cake of ice which never melts. The gas is then drawn down through a suction pipe to the compressor pump, where it is again liquefied, cooled, and stored in the coil, ready to repeat the cycle. In the non-electric

WHERE AN ARCTIC ATMOSPHERE PRESERVES FOOD



This shows how the interior of a great cold-storage warehouse is arranged. In the basement is the refrigerating machinery, which maintains a circulation of chilled brine throughout the storage floors. On the first floor we see the offices, then come the cooling rooms, where foodstuffs that would be injured by too much cold are kept. Higher up are the freezing rooms, where, by providing more brine pipes to the room, an intense cold is maintained. The building is lined with insulating material in order to keep out heat from the surrounding air.

refrigerators, the principle is essentially the same, but circulation is maintained, not by an electrically driven pump, but by convection and expansion produced by a minute gas flame. Thus we appear to have cold produced by heat!

The majority of industrial, large-scale refrigerators work on much the same principles. But huge compressors and immense circulatory systems are used.

In the "vacuum ice-making machines," water is cooled into ice by its own evaporation, speeded up in a vacuum. In some machines the vacuum is produced entirely by mechanical means, in others strong sulphuric acid is used to absorb the water vapour, in addition to an air pump.

"Compressed-air machines" are used to some extent for cooling and ventilating in places where vapours would be dangerous, as on war vessels.

Cakes of solidified carbon dioxide gas (marketed under such names as "dry ice") are also used. They are 15 to 20 times as effective refrigerants as ice, and evaporate directly from solid to gas without giving off troublesome liquid.

Refrigeration is also an important element in the new art of "air conditioning." Large refrigerating units are used in summer with the conditioning plants of theatres, factories, and large buildings, to maintain correct temperature and humidity. Smaller units are available for homes and offices. Railways are beginning to find air conditioning of passenger trains especially helpful in attracting business.

Reims. (Pron *rēmz* in French, *rans*), FRANCE. Towering in incomparable majesty above the other buildings of this city rises the great cathedral, one of the most beautiful and most celebrated Gothic buildings in the world.

During the World War of 1914-1918 Reims lay in the battle zone, and hundreds of shells struck the cathedral. The beautiful stained glass, centuries old, fell out of the windows in fragments. Many of the statues which adorned its front were broken or chipped, great holes appeared in the roof, and a fire burned out all the wooden parts of the interior. But the walls were so firmly built by the Gothic architects of long ago and the great stone-arched roof was so well vaulted that even the long bombardment

was not enough to destroy the main structure. After the War the cathedral was largely rebuilt, and in 1937 it was reconsecrated for public worship. (See illustration in page 868).

Reims is in north-eastern France, about 100 miles north-east of Paris, on the river Vesle. During the days that France was a monarchy most of its kings were crowned in Reims, and it was to the cathedral of Reims that Joan of Arc brought Charles VII for his coronation by the archbishop after she had defeated the English.

The principal industries of the city are the manufacture of fine woollen and silken fabrics and of champagne. The wine is kept in great vaults cut in the stone which forms the foundation of the city. It was chiefly in these vaults that the children went to school during the World War. The name is less correctly spelled



Norlen Lelch

MASSSED HERD OF ALASKAN REINDEER

One of the most important animals of the Far North of America, the reindeer is kept in vast herds in order to ensure sufficient food, as well as other necessities, for the inhabitants of those regions. The horns of this great herd, in the Yukon Delta, are so numerous as to look like a forest of bare trees.

Rheims. The population of the city today numbers about 116,000.

Reindeer. The stories of Santa Claus' reindeer steeds have made these members of the deer family familiar to children for many generations. Domesticated reindeer are kept by the people all round the Arctic circle, from Lapland to the Bering Sea. Domestication has resulted in changes of coat colour from a uniform dull greyish-brown to white, black, or piebald.

The reindeer can be distinguished from all their allies by the fact that both sexes have antlers. These are very large in comparison with the length of the skull. In the American reindeer or caribou (see page 833), the brow-tine or prong of one side is often tremendously developed, the other being stunted. The antlers, as well as the hoofs, are used in removing snow from their food, which, in the winter, is a lichen called reindeer-moss. Reindeer are heavily built, with short sturdy limbs, sometimes attaining a height

of nearly 5 feet at the shoulders. The large spreading hoofs with their cup like edges give the animal a good grip on boggy ground.

Reindeer yield good milk, and their flesh is used for meat, while their skins supply material for clothing. In cold countries they fill the place of horse, cow, goat, and sheep. They are able to draw about 300 lb. over the frozen snow at nine or ten miles an hour, and are so generally useful that much of Lapland and Siberia would be practically uninhabitable without these picturesque animals.

In 1892 domesticated reindeer were introduced from Siberia into Alaska. The original number was 1,280, there are now over 1,000,000. To secure reindeer the Alaskan Eskimos have to serve as apprentices in the care of the herds for four years, receiving at the end of that time a specified number of animals. These regulations have advanced the Alaskan Eskimos in less than a generation from the stage of nomadic hunters to the pastoral stage of civilization. It has been well said that "a reindeer herd is an Eskimo's bank account" (See also Caribou).

Religions of the World. Of the world's great religions Christianity (*q v*) has by far the greatest number of followers. Over one-third of the entire population of the world—some 692,000,000 people—profess some form of this faith. It is the great proselytizing religion. In 2,000 years of missionary work, migration, and conquest its adherents have carried its teachings to every continent. Today Europe, America, and Australia are overwhelmingly Christian, while the Christians in Asia and Africa are steadily increasing in numbers and influence.

In the last quarter of a century, while most other religions have stood still or declined, the number of Christians has increased by nearly one fifth. In the same period the number of Mahomedans has increased by one fourth.

This remarkable recent growth of Mahomedanism is due to a revival of the proselytizing spirit, in which Islam has been second only to Christianity. Missionary activities and military conquests carried this faith from its birthplace in Arabia (see Mahomet) far and wide, until now over 208,000,000 Moslems answer the daily calls to prayer.

Numerically greater than the Mahomedans are the 350,000,000 Confucianists and Taoists of China. They are the followers of two Chinese teachers, Confucius and Lao Tse, each of whom sought to establish a system of practical morality, Confucius emphasizing social service, and Lao Tse passive individualism, as the means of attaining the greatest good (See Confucius).

Hinduism is the principal religion of India, with about 230,000,000 adherents (See Hinduism). There are also some 77,000,000 Mahomedans in India, and the friction between the adherents

of the two faiths is a source of constant trouble to the government of the country. Buddhism, which also arose in India, spread over central and eastern Asia, and now claims nearly 150,000,000 adherents (See Buddha). In China and Japan it has existed for centuries along with Confucianism, Taoism, and Shintoism.

Shintoism, the religion of Japan, was largely absorbed into Buddhism when the latter faith was brought over from China.

Judaism (see Jews), the first of the great monotheistic religions (those teaching the doctrine of One God), has been carried westward by the Jewish migrations from Palestine, until today three fifths of the 16,000,000 Jews in the world are in Europe, and another fifth in America—mostly in the United States. The Jews regard Palestine as their natural home, and many thousands have migrated thither since the land became a British mandate.

The Christian Church has three main divisions, the Roman Catholic, Orthodox Eastern, and Protestant. No accurate figures are available, but latest estimates put the numbers of their adherents at about 331,000,000, 144,000,000, and 207,000,000, respectively.

The Roman Catholic Church thus claims nearly half the total number of Christians. The population of Europe, Latin America, and Oceania is predominantly Catholic, with the Orthodox Eastern Church leading in the Balkan peninsula, Asia Minor, Syria, and Russia. In the last-named the Church, if not actually persecuted, is regarded with official disfavour. The name "Uniat" is sometimes applied to Catholics belonging to one or other of the Eastern Rites.

The Orthodox Eastern Church, which separated from the Roman Catholic Church in the 11th century, adhering to the primacy of the Patriarch of Constantinople while the Roman Catholic Church adhered to the primacy of the Bishop of Rome, includes the Greek, Georgian, Russian, Serbian, Bulgarian, Syrian, Rumanian, and other Churches.

The largest of the Protestant Churches resulting from the Reformation begun by Luther in 1517 is the Lutheran. It has some 80,000,000 adherents, about two-thirds of whom live in Germany (where, as in Russia, Christianity is opposed by many of the State authorities—indeed, there is a Neo-Paganist or "Back to Paganism" movement) and Scandinavia. Methodists (whose three divisions in Great Britain became the United Methodist Church in 1932), Presbyterians, Anglicans (including the Protestant Episcopalians of U.S.A.), and Baptists follow (See frontispiece of this Volume).

Rembrandt. (Pron rem'-brahnt) (1606-1669). On July 15, 1606, there was born in Leiden, Holland, a boy who was to become one of the greatest painters of all time. Just as

Shakespeare could make a truth live through the reality of the men and women in his plays, so the artist Rembrandt—Rembrandt Harmensz van Rijn, to give him his full name—painted men and women so that they seem as alive now as they were 300 years ago

The Painter Painted by Himself

From the first, the boy showed so little interest in ordinary studies that he was allowed to follow his own bent—painting. All his early work showed his intense desire to learn to represent the lines, light and shade, and colour of the people he saw about him. Jewish beggars and venerable rabbis, prosperous merchants, soldiers, and cripples were his subjects. When he had no one else, he used himself as a model. It is estimated that he painted between 50 and 60 portraits of himself, not through any sort of vanity, but because he could use his own face as a mirror for the portrayal of all kinds of feeling.

Rembrandt's work had become so well known by 1631 that he moved to Amsterdam. The beautiful fair-haired Saskia van Vlyenborch, whom he married in 1634, was the model for many of his more fanciful pictures. In addition to portraits and set pieces, Rembrandt attained fame for his landscapes, while as an etcher he is generally reckoned the greatest of all time.

Rembrandt produced some 700 pictures, of which about 500 remain. There is one, however, which shows his powers in a way that is typical of all his work. It is in the Royal Museum of Amsterdam, and, though long known as "The Night Watch," has been proved to be a daylight scene. It is a life-sized picture of a group of 29 civic guards hurrying out of their club house.

Each man is painted with the loving care that Rembrandt gave to single portraits, and yet the composition is so wonderful that the separate figures are made second in interest to the effect of the whole. The canvas is brilliant with colour, movement, and light. In the foreground are two men, one in bright yellow and the other in black. Rembrandt knew how to let the shadow of the one tone down the high light of the other. In the centre of the painting is a little girl dressed in yellow. Many people wonder what she is doing all alone in that crowd of men. To such as they, another artist has said: "If Rembrandt could have heard them he would have answered with a laugh, 'Don't you see that I only wanted this child as a focus for the light and a contrast with all the downward lines and dark colours?'"

During the later years of his life Rembrandt lost some of his popularity, his vast collection of paintings was sold at auction before his death, fetching far less than its true value, and he died poor and obscure.

Rembrandt is now recognized as the one really great artist of the Dutch school whose work can stand comparison with that of the finest painters of Flanders or Italy. His greatest qualities were perhaps his handling of paint in achieving effects of colour and light, and his intense interest in humanity, to which is due the reading of character which marks his portraits. His sitters, whatever their age or station, are live people. (See also Netherlands Art and illustrations in pages 1540 and 2932)



MASTERPIECE FROM THE BRUSH OF REMBRANDT

Perhaps no painter has ever excelled Rembrandt in subject pieces such as this. Called "The Night Watch," it represents a group of citizens, members of a guild in Antwerp, marching in military costume. Each face is painted to reveal the character of the man, while the picture as a whole is so well designed and executed that one loses nothing of its greatness for all the telling detail. Brilliant contrast of light and shade was one of the things in which Rembrandt especially excelled.

Royal Museum Amsterdam photo B. F. Mansell

DAWN of the MODERN AGE in EUROPE

The end of the "dark" ages came with the rediscovery of ancient civilization, art, and philosophy, and the world was reborn in a glorious period of discovery and invention. This is what we call the Renaissance

Renaissance. In a narrow sense the term Renaissance (meaning "rebirth") refers to the revival, in the 14th and 15th centuries,



Erasmus, by Holbein

of Greek and Roman culture. Historians formerly drew a sharp contrast between the so-called "darkness" of the Middle Ages (q v) and the brilliance of the Renaissance, when Europe was supposed to have become quickly enlightened by the recovery of the classical civilization of ancient Greece and Rome. It is now known that the change from the Middle Ages to the Renaissance was gradual and less important than historians formerly believed. It is also recognized that there were in operation many important forces besides the revival of classical culture. Nevertheless, the fuller appreciation of the writings, the arts, and the attitudes of mind of the Greeks and the Romans is still viewed as perhaps the most distinctive feature of the period. First, let us consider the revival of ancient culture.

Italian Poets Lead the Way
Dante (1265-1321), who wrote his soul-stirring "Divine Comedy" in Italian instead of Latin, was "the glimmer of the dawn" of the Renaissance, while Petrarch (1304-1374) may be called its real initiator in the field of literature and learning. Petrarch not only wrote exquisite sonnets in Italian, but he "aroused classical antiquity from its long winter sleep," and gave direction to a hundred others.

To the studies of Petrarch and his followers, as distinguished from the "Scholastic" philosophy and theology of the Catholic thinkers of the Middle Ages, the name *litterae humaniores* ("more humane letters") was given. From this we derive our term "humanists" for such scholars. Classical literature not only supplied them with standards of better literary form, but disclosed "a new conception of life, a conception freer, larger, more rational, and more joyous than the medieval, one which gave unfettered scope to the play of the human feelings, and to all the activities of the intellect."

Today Petrarch's friend and fellow townsman, Giovanni Boccaccio (1313-1375), is chiefly known

for his witty stories, entitled the "Decameron," but even more important was his part in carrying on the revival of learning. For Boccaccio was the first Italian in seven centuries to learn to read classical Greek. In addition he wrote many Latin works of scholarship, which helped in the search for and identification of the lost writings of ancient literature. Soon hundreds of eager scholars were engaged in the work of spreading abroad the "new learning."

Scholars Bring New Life to Europe

Princes, churchmen, and nobles in Italy now gave to literature and art the close attention which, north of the Alps, was bestowed upon the stables and kennels, and the place of the knight errant was taken by the wandering humanist, who sought manuscripts as the knight had sought adventures.

And how much of real romance is packed into the history of that quest! Over 700 ancient Latin writers are known to us by name, but the works of less than a fifth of these have survived even in part. That we have so much is due to the tireless efforts of men like Petrarch and Boccaccio, Niccolò de' Niccoli, the collector whose 800 manuscripts formed the nucleus of the Florentine library, Poggio Bracciolini, who had great success in the monasteries of Switzerland and brought back to the scholars of Italy manuscripts of Cicero and Lucretius, Nicholas V, the first humanist Pope, and a host of others who, before the age of printing, rescued from the neglect of the Middle Ages the priceless works of the ancient Greek and Latin authors. The fall of Constantinople before the Turks in 1453 had an important effect upon the outlook of Italy and the Western world, since it caused the dispersion of Greek scholars from that ancient centre of classical learning. Many of the refugees settled in the towns of northern Italy and taught Greek there, and in this way the links with classical traditions were still further strengthened.

Two agencies chiefly helped to spread the Renaissance beyond the Alps. The invention of printing, about 1450, was one of these (see Printing), Erasmus of Rotterdam (1466-1536) was the other.

Holland's Great Humanist

Charles Reade's "Cloister and the Hearth" tells the story of the unhappy parentage of this famous Dutch scholar. Thrust into a monastery while still a mere boy, he became by his brilliant talents the protégé of princes and prelates. He spent his manhood in furthering the revival of

Greek and Latin learning in France, England, Switzerland, and Germany

His "Handbook of a Christian Soldier" was a manual of practical piety which ran through edition after edition. His "Praise of Folly" (*Encomium Moriae*), a satire on clerical and lay shortcomings, written in England while resting in the house of his friend Sir Thomas More after a visit to Italy, set all Europe laughing. On the other hand, his printed editions of the Greek New Testament (1516), and his editions of the writings of the early Church Fathers laid the foundations for a sounder Biblical theology.

Printing Spreads the New Knowledge

Scores of scholars north of the Alps worked to the same ends, the newly-founded German universities and the magic art of printing carrying the seeds of this revival of learning far and wide over western Europe. Men like Aldus Manutius, who started the famous Aldine Press in Venice towards the end of the 15th century, and Robert and Henri Estienne (or Stephanus), who had a printing establishment in Paris and later in Geneva, were both great printers and great scholars, and by their fine editions of the classics were important factors in the diffusion of classical culture.

Parallel to this awakening of the human intellect was a great development of the fine arts. After centuries of stiff symbolic representation, artists began again to study Nature herself and to work from the living model. New ideas of grace, harmony, and beauty were gained from the sculpture and other artistic remains of classical Greece and Rome. Presently came the discovery of better technical methods of execution—of the laws of perspective and the process of painting in oils. The result was that the art of painting burst into a glory previously unknown, and sculpture and architecture rivalled the grandeur of the ancient days.

Artists of the Rebirth

As in the revival of learning, Italy again led the way, though the countries beyond the Alps soon followed. The dawn of the new age came with the sculptors Nicholas, John, and Andrew of Pisa. Contemporary with them was Giotto of Florence (c. 1266–1337)—sculptor, architect, painter, and friend of Dante. Ghiberti, Donatello, and della Robbia—the last the creator of charming medallions of children in glazed terracotta—continued the work in sculpture, Fra Lippo Lippi, Botticelli, Ghirlandajo, and Perugino in painting, and Brunelleschi and Bramante in architecture. The tumultuous exuberance of Gothic art gave way to the serene and rational beauty of the classic orders, the pointed arches to rounded Roman ones, the aspiration of vertical lines to the restful calm of the horizontal. St Peter's in Rome sums up in itself the spirit of Renaissance architecture.

The full flowering of Renaissance art came in the late 15th and early 16th centuries, with Raphael, the prince of painters, and Leonardo da Vinci and Michelangelo, embodiments of supreme many-sided genius. With these flourished the lesser lights—Andrea del Sarto, "the faultless painter", Correggio, who depicts Christian saints with pagan charm and beauty, Titian, the superb master of Venetian colourists, and Tintoretto, a master of technique. Benvenuto Cellini (1500–1571) was a typical figure of this period. He swaggers through the pages of his "Autobiography," fighting and quarrelling, and at the same time producing works of art, statues and carvings and medals, that are beyond praise.

North of the Alps—in Flanders, Holland, and Germany—the chief names are the brothers Van Eyck, Albrecht Durer, and Hans Holbein, the two last being famous exponents of the new art of engraving as well as of painting.

Waning of the First Inspiration

In any great movement, sooner or later enthusiasm begins to wane. The study of Latin and Greek became formalized into an uninspiring routine discipline. Many writers became mere imitators of the ancients. Art degenerated into such extravagances as baroque sculpture and architecture. Individualism often became a mere cloak for unclassical lack of moderation and self-discipline. Rulers often adopted the view that the end justified the means, and the end was likely to be a selfish exercise of power. Such views are called Machiavellian, from Machiavelli of Florence (1469–1527), author of "The Prince," a book on statecraft. All this and more may be said in criticism of the late Renaissance, yet the inspiration derived from humanism still endures.

In the early modern age the creative spirit found expression in many ways—in the writings of Rabelais, Cervantes, and Shakespeare, in the music of Palestrina, in the invention of the operatic form of music, in the invention of the compass, gunpowder, and printing press, in the work of the scientists, such as Copernicus, Vesalius, and Galileo, in the awakening of national consciousness and the formation of strong central governments, in the building of cities, in the reorganization of business, in the adventurous voyages of Diaz, Vasco da Gama, Columbus, and Magellan, and in the marvellous energy displayed by Europeans in carrying their civilization to all parts of the known world.

Greek and Roman civilization was a civilization of towns and city states. The people of the Middle Ages were overwhelmingly agricultural. Thus, in a broad sense, the Renaissance also included a great expansion of town life.

The first impetus to this expansion was given by the Crusades. Knowledge of new goods and

GEMS OF RENAISSANCE ART AND ARCHITECTURE



Art flourished in marvellous luxuriance during the Renaissance, and above are seen some outstanding examples of the work of this period. Top left the historic Château of Blois, with the celebrated spiral staircase tower projecting into the courtyard. Top right the tomb of Henry VII, in Westminster Abbey, this was the work of a Florentine sculptor, Pietro Torrigiano. Centre a medallion of an infant by Andrea della Robbia in the foundling hospital at Florence. Lower left "La Pietà," statuary group by Michelangelo, in St. Peter's, Rome. Lower right Raphael's painting of Pope Leo X.

Photos Donald McLeish W. T. Mansell Anderson Allnari

of new opportunities for trade and adventure stimulated a keen desire that, in turn, resulted in the finding of methods to overcome obstacles in the way of distant trading

By the 14th century Europeans were trading, indirectly, with countries as far away as India, China, and the Spice Islands. Italians, especially Venetians, sent fleets to ports of the eastern Mediterranean. Here they secured spices, gems, drugs, and finely-fabricated goods collected in oriental markets, bazaars, and fairs, and carried westward by successive groups of merchants.

In the 14th century the writings of Ptolemy (*qv*), the great geographer of the ancients, had been recovered. Ptolemy had suggested that one would reach India by sailing westward. Before Columbus tried to carry out this idea the Portuguese took the lead in western explorations.

The immediate results of the great geographical discoveries included the break-down of Italian and German trade, the transfer of trading centres, wealth and power to the Atlantic seaboard, the rise of the Portuguese and Spanish empires, and the most unbelievable stirring up of the sluggish minds and ambitions of Western Europeans. Out of the double stimulus of the recovery of ancient culture and the discovery of the nature and limits of the world's geography came most of

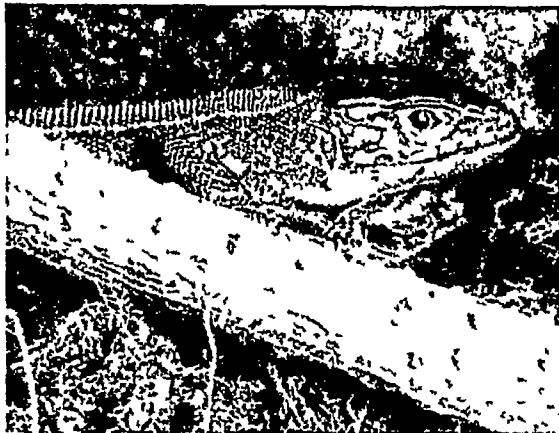
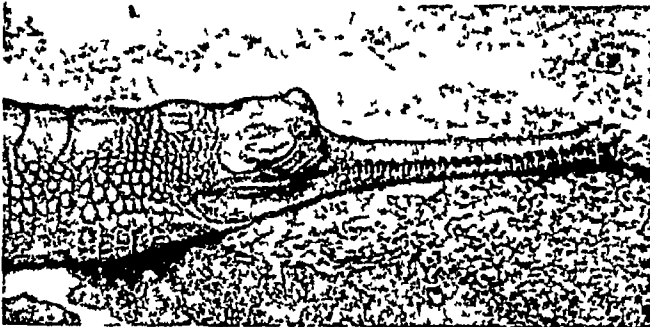
the distinctive ways of thought and of life that make our age different from earlier ages.

(See also the separate articles on many of the great artists and scholars mentioned, and on the art of Italy, France, Netherlands, England, etc.)

Renfrewshire, SCOTTISH CO. Though one of the smallest counties of Scotland—it is 240 square miles in area—Renfrewshire comes fourth in population (288,575). Situated in the south-west of Scotland, it is bordered on the north by the Firth of Clyde, on the west by the sea, and on the south by Ayrshire. The land is low and undulating, except in the south. The northern area is densely populated and highly industrial. Paisley (population, 86,400) is the largest town, and is noted for its cotton thread industry. Greenock (population, 78,900) is a big shipping and shipbuilding centre, and Port Glasgow (population 19,500) is occupied in many of the trades allied to shipbuilding.

Renfrew, the county town, has a population of only 14,900, and is engaged in engineering, weaving, and dyeing. The central undulating plain is devoted mainly to pasture and oats.

Reptiles. The "creeping creatures" that we call reptiles—the tortoises, crocodiles and alligators, lizards and snakes—have an exceedingly ancient and important history. Some millions of years ago their ancestors ruled the



FEARSOME HEADS OF THE FOUR MAIN REPTILE GROUPS

The very word reptile conjures up a picture of something unpleasant, and these heads of typical members of the class show how well justified is this idea. Top left is a gharial, an Indian member of the crocodile group, its great snout is used for catching fish. Top right we see the head of a deadly puff adder, its jaws opened to show the terrible fangs. Below, on the left, is a green lizard, a species sometimes found in England. Finally, bottom right, is a hundred-year-old tortoise.

(Photos: I. W. Bond; II. S. Bertrige; M. H. Crawford; Photopress)

REPTILES

earth Among these ancient reptiles were the largest land monsters that ever lived—the dinosaurs Among them also were the ancestors of the birds and the mammals At the other end of the chain, the reptiles are believed to have developed from the “amphibians” or “batrachians,” of which frogs, toads, newts, and salamanders are the modern representatives, and these, in turn, probably developed from the fishes Thus reptiles occupy a central position in the evolution of vertebrate or “back-boned” animals

Today the reptiles have fallen from their high estate With the exception of certain groups of snakes, the reptiles as a whole appear to be degenerating and dying off They have been greatly reduced in numbers as well as in size, the crocodile being the largest living representative of the class More than 20 groups flourished during the “Age of Reptiles,” whereas but 5 groups now remain One of these groups contains but a single living species, the tuatara or *sphenodon* of New Zealand, a curious survivor from prehistoric days (See page 2532)

The living orders of reptiles consist of tortoises, *Chelonia*, crocodiles and alligators, *Crocodylia*, lizards and snakes, *Sauria*, tuataras, *Prosauroia* The chief extinct sub-class of reptiles are the dinosaurs, land living monsters, the plesiosaurs, aquatic, with long necks and paddle feet, the ichthyosaurs, whale-shaped sea dwellers, and the flying pterosaurs, which included the pterodactyls (See Prehistoric Animals) In prehistoric times, even the modern reptilian groups were represented by gigantic forms

Although they have decreased so greatly in importance, the reptiles still cover a wide range of activities They walk, run, crawl, burrow, and to a certain extent even fly, for some of the lizards as well as one or two snakes are equipped with folds of skin along their sides, by which they can parachute themselves from tree to tree Other snakes, as well as members of the turtle and lizard group, are thoroughly at home in the sea (though these are not “sea serpents”) These and the curious activities of the various other groups you will find described under their own headings (See articles on Lizard, Snake, Tortoise, etc)

RESPIRATION

Resins. Often, when you are climbing a pine tree, or examining some of its wood, you find your hands and clothing becoming covered with a very sticky, pleasant smelling substance This is “turpentine,” or, in its purified form, “rosin,” the best-known of those important plant gums, the resins

Rosin is largely used in paints and varnishes and in the making of laundry soap and sealing-wax, and to rub on the strings of violin bows to keep them from slipping

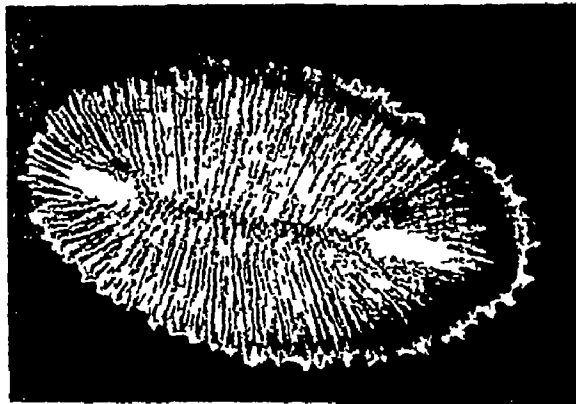
Among the many other resins are the copals, very variable and important for varnishes, gamboge, the brownish resin obtained from plants in Cochin-China and Siam, used as a yellow pigment and in medicine, myrrh, the fragrant resin of several plants in Arabia and Abyssinia, which is largely used in the manufacture of incense and perfumery and also in medicine The “dammar” resins from several different coniferous trees of India, New Zealand,

Australia, and the East Indies are widely used in making varnishes Shellac, also ranked as a resin, is produced from the crushed bodies of certain scale insects feeding on various trees (See Lacquer) Amber is a fossil resin (See Amber)

Synthetic resins made from various chemicals, and also those made from cellulose, are becoming more and more important in many industries They resemble natural resins in plasticity and in many physical properties, but They rank for the most part among the plastics, and some, such as the transparent “Perspex” and its relatives, are of tremendous importance (See Plastics)

Respiration. In animals respiration or breathing is carried on by three kinds of organs—gills, lungs, and air tubes—and some creatures even breathe through their skin Gills are adapted for respiration in water, and lungs in free air Gills occur in clams, crayfish, squids, and some other invertebrates, and in all fishes

Respiration consists in an exchange of oxygen for carbon dioxide (CO_2) between the living cells and the air Special organs of respiration are not necessary to accomplish this end The earthworm, for example, breathes through its skin—that is, the blood comes close to the surface in thin-walled vessels, where the exchange between it and the air is accomplished Oxygen



CATERPILLAR'S RESPIRATORY ORGAN

Through a series of spiracles like this one the caterpillar breathes, this photograph (in which the spiracle is magnified about 300 times) shows the innumerable hairs, pointing inwards from the walls of the spiracle, which open and shut as the air rushes in

Photo H S Chearin

not in chemical nature They rank for the most part among the plastics, and some, such as the transparent “Perspex” and its relatives, are of tremendous importance (See Plastics)

Respiration. In animals respiration or breathing is carried on by three kinds of organs—gills, lungs, and air tubes—and some creatures even breathe through their skin Gills are adapted for respiration in water, and lungs in free air Gills occur in clams, crayfish, squids, and some other invertebrates, and in all fishes

Respiration consists in an exchange of oxygen for carbon dioxide (CO_2) between the living cells and the air Special organs of respiration are not necessary to accomplish this end The earthworm, for example, breathes through its skin—that is, the blood comes close to the surface in thin-walled vessels, where the exchange between it and the air is accomplished Oxygen

enters the blood from the air, and carbon dioxide passes from the blood into the air. In the simplest animals, like the amoeba, where there is no blood, the breathing is done by the protoplasm of the body, but the exchange of carbon dioxide for oxygen is essentially the same as in higher animals.

It must also be understood that respiration in plants is of the same nature as in animals. In breathing they take in oxygen and give up carbon dioxide at all times, but such respiration is balanced in plants by the process of photosynthesis (See Leaves, Plants). In this, plants use carbon dioxide in their process of nourishment, and they return free oxygen to the air as a left over product. As that process takes place in the sunlight, it was at first supposed that the oxygen was set free in daylight, the process of respiration being confused with that of photosynthesis.

Fishes possess gills throughout life. The amphibia have them in larval stages, and, in some forms, both gills and lungs exist in the same individual. Insects have air tubes for breathing extending through the body.

Lungs occur in the higher animals. They are developed as sac-like expansions of the walls of the pharynx, blood-vessels are spread over them, and air is introduced into the inside (See Blood, Lungs). An account of how to practise artificial respiration is given under the heading of First Aid.

Revere, PAUL (1735-1818) Paul Revere aided the cause of the Colonists during the War of American Independence (qv) but his name is mainly associated with his famous ride from Boston to Lexington to warn the militia of the approach of the British soldiers.

Revere was a Boston goldsmith. He had been one of the courageous men who took part in the "Boston Tea Party," when many chests of tea were thrown into the harbour by disguised Colonists, and in 1775 was at the head of a committee to watch the movements of the British troops. When it

was known on the night of April 18 that the latter intended to march to Concord, Revere, having waited for the signal in the North Church tower rode to Lexington, rousing the Colonists on his way. At Lexington he was captured by the British and held during the day, but a companion got through to Concord. His exploit is the theme of a famous poem by Longfellow.

Reynolds, SIR JOSHUA (1723-1792) "Sir Joshua, sir, would as soon get me to paint for him as to write for him!" was Dr Johnson's indignant retort when taxed with the authorship of the eloquent "Discourses delivered to the Students of the Royal Academy by Sir Joshua Reynolds."

It is generally agreed that Reynolds is the finest portrait painter we have ever produced, and in many ways he ranks among the greatest



BEAUTY PORTRAYED BY REYNOLDS' ART

Sir Joshua Reynolds, intimate friend of Dr Johnson, Burke, Garrick and Goldsmith, and first president of the Royal Academy, was a master of portraiture. Fine draughtsman and wonderful colourist, he became the most popular portrait painter of his time. This portrait of Nelly O'Brien, now in the Wallace Collection, is considered to be one of Sir Joshua's finest portraits of women.

of the world's practitioners in this form. It is agreed, too, that he was at his best when painting men, and chiefly men of his own circle, such as David Garrick, the actor, Burke, the statesman, and Laurence Sterne, the writer. Yet when one sees his paintings of women, such as "Mrs Siddons as the Tragic Muse," and the amazing "Nelly O'Brien" in the Wallace Collection, and his delightful children, such as "The Age of Innocence" (see page 1506) and "Master Crewe," one realizes that he was indeed master of every branch of his art. Even where groups are concerned, his usual failures are discounted by "The Duchess of Devonshire and her Baby" and several equally great works.

Life of the Great Painter

Reynolds was born at Plympton Earls in Devonshire, July 16, 1723, and from his youth was trained as a painter. As a young man he was enabled by one of his patrons to visit Italy, and it was this visit which put him head and shoulders above his contemporaries in Britain. He was almost thirty when he finally settled in London, which remained his headquarters until his death on February 23, 1792.

Reynolds was a principal founder of the Royal Academy in 1768, and as its first president received the honour of knighthood. As its president, too, he delivered the celebrated "Discourses" already referred to.

As a painter, Reynolds was always experimenting in new techniques, and that is why so many of his pictures have suffered with age, cracking, losing their colour, and turning black. Yet at his best he has the colour of the Venetians, the insight into character of Rembrandt, and his liveliness, too. He is represented by many fine paintings in the National Gallery, the National Portrait Gallery, the Wallace Collection, and the Royal Academy.

Rhetoric. Grammar teaches the proper uses of words and how to combine them correctly into sentences. Rhetoric goes farther and teaches us to speak and write not only correctly but *effectively*—so as to produce a desired impression upon a reader or hearer. Grammar says, "This is right, that is wrong." Rhetoric says, of two or more ways of putting an idea, "This is the best way to convey the thought." Rhetoric seeks not only correctness, but also *clearness, unity, force, and beauty*.

Rhetoric was first taught by the ancient Greeks and meant originally the art of the orator, of speaking so as to persuade or move others. The methods used by the rhetoricians were not always the highest, for some of them did not scruple to "make the worse appear the better cause," aiming at success rather than truth. The abuse of the art of rhetoric accounts for the use of the term, as we sometimes hear it, in the sense of affected and artificial language.

However, Aristotle (*qv*), who in the 4th century B C wrote a treatise on rhetoric which has never been surpassed in grasp of the scientific principles of writing, taught that this was not true rhetoric, and all who have thought deeply about the subject agree that no tricks of expression can take the place of sound reasoning, and that power and true beauty go hand in hand with sincerity.

In later times, especially since the invention of printing, writing has come to be more important than oratory, and so rhetoric has become concerned more with the art of writing than with that of speaking. But it is well to remember its connexions with oratory.

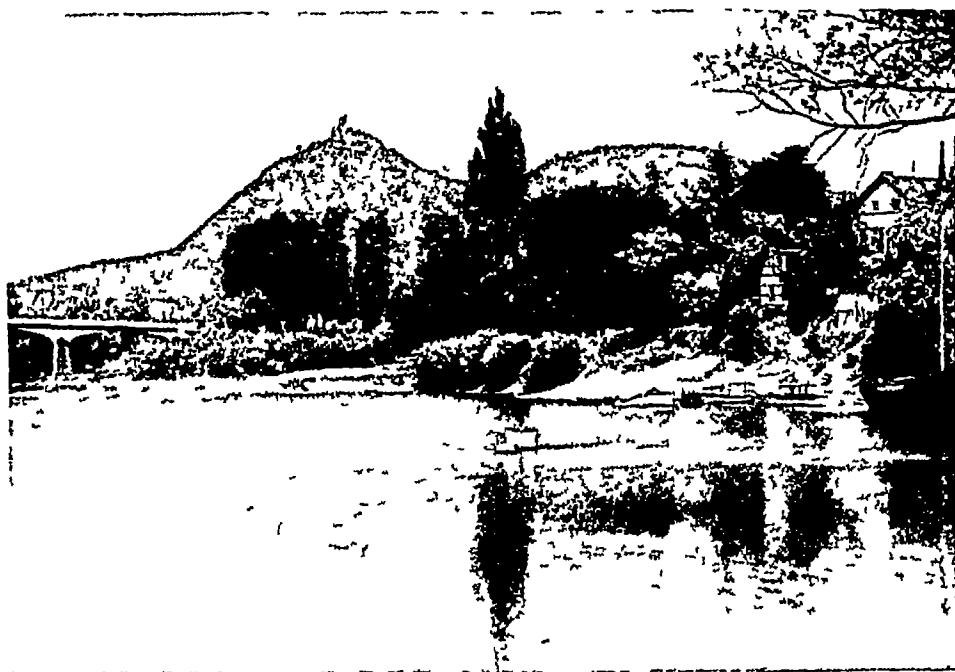
If in writing we put ourselves in the place of the orator, who must so express himself that his message will strike home to his audience, we shall write more clearly, and, what is hardly less important, more suitably. We shall be less likely to make such bad mistakes as using flowery poetic language in a business letter or the language of everyday conversation in an essay on a lofty subject. We shall be able to write more interesting stories if we have in mind someone listening to these stories, we can write better descriptions if we are trying to make someone else see what we see. (See also Figures of Speech.)

Rhine, RIVER. Through the ages, the beautiful Rhine has stirred the desires and the fancies of men. Conquerors from Charlemagne to Napoleon have fought to possess this shining avenue of commerce. To the German, the Rhine is symbolical of patriotism, and one of his best loved national songs is called "The Watch on the Rhine."

The Rhine takes its rise among the Alps of Switzerland, and after a northerly course of about 850 miles empties itself into the North Sea. The area drained by the river and its tributaries is estimated at nearly 100,000 square miles. It is divided into the upper, middle, and lower Rhine, the first being the river from its mountain source through the Lake of Constance to Basle, the second its course from Basle to Cologne, and the third its course from Cologne through the Netherlands to the sea.

Canals connect the Rhine with the Rhône, the Danube, and other rivers, opening lines of water communication with France and Belgium on the one side and with the Netherlands and every part of Germany on the other. The Moselle joins the Rhine at Coblenz, nearly opposite its confluence with the Lahn. It is the largest tributary, and the Moselle from Coblenz to Trier is fully as beautiful as the Rhine itself. Other tributaries of the great river are the Main, Ill, and Neckar.

The falls of the Rhine at Schaffhausen are to Europe what Niagara is to America. The



THE RHINE RIVER OF ROMANCE

What fascination the Rhine has always had for the mind of a German! For him "Father Rhine" is the symbol of his country, and its romantic valley has inspired many of the world's most beautiful legends, like that of the Lorelei. Here is the Rhine seen from Honnef, with the castle of Drachenfels in the distance.

Courtesy of German Railways Bureau

picturesque castles and terraced vineyards of its middle course make a trip on the Rhine one long to be remembered. Among many points of interest are the castles of Rheinstein, Rheinfels, Drachenfels, and Stolzenfels, the frowning fortress of Ehrenbreitstein, the "German Gibraltar," overlooking the confluence of the Rhine and Moselle at Coblenz, quaint old Bingen with its "Mouse Tower," where Archbishop Hatto was, according to the legend, devoured by mice, and the grey rock where once the Lorelei, with her golden hair and great beauty, lured fishermen to destruction. (See illustration in page 2057)

Famous Old Rhine Cities

Important cities on the Rhine are Strasbourg, in Alsace, with a famous cathedral and university, Spire (Speyer), and Worms, towns of Reformation memories, Mainz and Cologne (qv) seats of Catholic archbishops, whose great cathedrals tower over the modern buildings, busy industrial Mannheim and Dusseldorf, on the delta of the Rhine, in the Netherlands, is the great port of Rotterdam.

In 1936 Germany startled the world by announcing the remilitarization of the Rhineland—a step contrary to the Treaty of Versailles. The river is now refortified and guarded by German troops. It was only in 1925–26 that the last troops of the Allied Occupation (following the World War) left the Rhineland. Most of the traffic on the Rhine is concerned with fuels, ores, and cereals. The chief local industry is the production of Rhine wines.

Rhinoceros.

(Pron ri-nos'-er os)

A tiger's claws and a lion's teeth have no terrors for the rhinoceros. He wears a skin-armour so thick and tough that even the sharp spear of the native hunter cannot pierce it. And this great lumbering creature can crash through the jungle at such speed and use its terrible horn in such a way as to keep even the lion at a distance.

Its appearance is not attractive. The legs are short and thick, its feet broad and heavy, with toes encased in hoof-like nails. The small tail ends in a tuft, and the large pig-like head

is surely as ugly as Nature ever formed. The eyes are small, the keen ears large and erect. The upper lip, which is long and pointed, reaches out and over the lower, and above it on the extended nose is the great horn, which may be a foot or more long. As if this were not enough, Nature has given some species a second and shorter horn just behind the first.

With its horn the rhinoceros not only defends itself but easily uproots the shrubs and young trees. It is with this horn, too, that the mother pilots her calf about the jungle. It runs in front of her and she seems to guide it by holding the tip of her horn against it.

Excepting elephants, the rhinoceros is the largest earth-living animal. Of the five species now found, the largest stands 6 feet 6 inches high. Ages ago much larger rhinoceroses ranged over both the Eastern and Western hemispheres, and in the glacial epochs the woolly rhinoceros was clothed with long hair (see page 885). Now, however, they run wild only in Africa and Asia.

The habits and appearance of the species differ. The greyish-black skin of the Indian species is arranged in great folds that give it the appearance of plates of heavy armour. In Africa there are two species, each with two horns—the black rhinoceros, which has a smoother skin with less marked folds, and the "white" rhinoceros, the largest of all, which is not white at all but is greyish, being distinguished by its much longer front horn, and a tiny tuft of hairs on each ear. Some rhinoceroses live on plains, some in swampy jungles. Generally they sleep

RHINOCEROS

during the day and move about in the cool of the evening and at night Unless molested they are peaceful, but they are, however, very bad tempered Although their senses of smell and hearing are well developed, they are extremely short sighted, a fortunate circumstance for anyone who disturbs one unawares

Rhinoceroses are seldom seen in herds, generally they are found singly or in pairs They are no longer common, for they do not increase rapidly and have been much hunted The oldest one known was an Indian rhinoceros that lived 40 years in the London Zoo

Rhode Island, USA Though the most densely populated State in the American Union, Rhode Island is also the smallest, its area being only 1,248 square miles Providence, the capital, has a population of 243,000, and other important towns are Pawtucket, Woonsocket, and Newport, a favourite summer resort, which stands on the island (in Narragansett Bay) from which the State derives its name

Rhode Island is one of the greatest manufacturing States of the U S A Cotton-spinning was long the leading industry, but it has now been outstripped by the making of woollens and worsteds The total population of Rhode Island is about 687,000

Rhodes. A junk dealer long ago hauled away the last fragments of the Colossus of Rhodes, the great bronze statue that was one of the Seven Wonders of the Ancient World (See

RHODES

Seven Wonders) Children in the Street of the Knights swarm out of doorways carved with the arms of nobles of medieval Europe Old men sit on stone stools that were Turkish cannon-balls So life moves on in time scarred Rhodes, capital of the mountainous island of Rhodes (*Rodi*), farthest east of the Aegean Isles Peasants are happy with their fat cattle and their goodly crops of grapes, olives, tobacco, vegetables, and grains

Ten miles from the coast of Asia Minor, Rhodes was the cross roads of the most important marine highways of ancient times The once powerful city was laid out in 408 B C, and in the 3rd century was the gathering place of orators, artists, and sculptors The famous Colossus, erected in 280 B C, was wrecked by earthquake 56 years later In 1309 Rhodes was captured by the crusader Knights Hospitallers of St John of Jerusalem, and it was these knights who built the fortified medieval city which still stands The Turks captured the island in 1522 and held it until the Italians occupied it in 1912 Italy's possession was confirmed in 1924

The island has an area of 542 square miles, and a population of about 56,000

Rhodes, CECIL JOHN (1853-1902) While making a solitary eight months' journey over the rolling veldt of that part of South Africa which now bears his name—Rhodesia—Cecil Rhodes dreamed the dream which shaped all



FEROCIOUS WHITE RHINO IN THE KENYA JUNGLE

Richard Usher

The so called "white" rhinoceros—it is actually pale greyish in colour—is one of the most dangerous of beasts, for it has a terrible temper which is easily roused, and will attack humans unprovoked Here one can see the distinctive square lip and terrible horns of this huge beast, which is now becoming extinct. The black species is illustrated under Africa.

RHODES

his future life. He was only 20 years of age at the time, yet he had already won a fortune in the diamond fields of Kimberley.

A passionate believer in the destiny of the Anglo-Saxon race, Rhodes was impressed by the boundless possibilities of this undeveloped country, and became fired with an ambition to "paint as much as possible of South Africa British red"—that is, to bring it into the British Empire.

To this task all Rhodes' energies were thenceforth devoted. He had the satisfaction of seeing part of his dream realized. He added 700,000 square miles of territory to the British Empire, and planned the Cape-to-Cairo railway to connect the Cape of Good Hope with the mouth of the river Nile, but he did not live to see the federation of the states of South Africa.

Rhodes was born on July 5, 1853, in the vicarage of Bishop's Stortford, Herts. At the age of 17 heart trouble forced him to give up his plan to go to Oxford University. He joined a brother in South Africa just in time to take part in the rush to the newly-discovered diamond fields, and within a few months he had made a fortune.

This vigorous life so improved his health that he was able to take up his work at Oxford. For eight years he alternated between the University and South Africa. In 1881, just before taking his degree, he was elected to the parliament of Cape Colony, and in 1890 he became its Prime Minister.

Rhodes now became virtually dictator of South Africa. In addition to his political power, he controlled, through his vast business interests, the great consolidated diamond and gold-mining interests of the country, and was managing director of the British South Africa Company, which he had formed to develop the territory that so struck his youthful imagination.

Disaster came six years later, through his connexion with the ill-fated raid of his friend, Dr L. S. Jameson, into the Transvaal to support a projected rising of the British diamond-diggers

in Johannesburg. Rhodes was forced to resign the premiership and give up control of the South Africa Company, because it was proved that he had aided this armed attack on a friendly state.

One of the most picturesque incidents in Rhodes's career came a few months later, when the Matabele natives revolted. Attempts to suppress the rebellion having proved futile, Rhodes pitched his tent away from the troops at the foot of the impregnable Matoppo hills where the natives had retreated, and patiently

waited. His courage so amazed the chiefs that they invited him to a council in the fastnesses of the hills. Rhodes and three companions rode unarmed into their midst, heard their grievances, and promised redress, and the rebellion was over.

He re-entered the Cape Parliament in 1898, and had made some progress towards regaining his old power, when the Boer War (1899-1902) began. Rhodes hastened to Kimberley, where he took an active part in defending the town and mines against the Boers. Privations and incessant labour during the siege broke his health, and he died on March 26, 1902. He was buried in a tomb hewn from the granite of the Matoppo hills. There is also a magnificent memorial to Rhodes on the slopes of Table Mountain. His

house near Cape Town, Groote Schuur, was left by his will to the Prime Minister of a federated South Africa.

Rhodes bequeathed the bulk of his huge fortune for the endowment of scholarships at the University of Oxford, to be awarded annually to selected students from the British Dominions and Colonies, the U.S.A., and Germany. In 1916 the German Scholarships were suspended until after the War.

Rhodesia. One of the dreams of Cecil John Rhodes (*qv*) was the formation of a United South Africa, under the flag of Great Britain. He it was who founded the British South Africa Company, which had jurisdiction over

RHODESIA



RHODES, THE EMPIRE BUILDER

Here is an artist's impression of General French's meeting with Cecil Rhodes at the Sanatorium Hotel, Kimberley, on the evening of the relief of the town after it had been besieged for four months in 1899-1900 by the Boers.

RHODESIA

the huge area since named Rhodesia in his honour. It is divided into two areas—Northern Rhodesia and Southern Rhodesia—by the Zambezi.

Northern Rhodesia is bounded on the north by the Belgian Congo and Tanganyika Territory, on the east by Nyasaland and Mozambique,

Extent.—The total area of Northern and Southern Rhodesia is 440 600 square miles. Population 2 700 000 of whom 68 850 are Europeans.

Physical Features.—High tableland (average height 3,000 feet) traversed by the Zambezi, Chambezi, and Sabi rivers. Lake Bangweulu in Northern Rhodesia.

Products.—Tobacco, maize, fruit, wheat, cotton, coffee, cattle and dairy farming, silver, gold, iron, chrome ore, copper, zinc, lead, vanadium, coal, diamonds and asbestos.

Principal Towns.—Lusaka (500 whites) and Salisbury (32,000 in all), capitals, Bulawayo (29 000 in all), Broken Hill (1,500), Ndola (1,400).

and on the west by Angola and Damaraland. It consists of a sparsely-forested, lofty tableland, ranging between 3,000 and 6,000 feet above sea level. The tributaries of the Zambezi and Chambezi drain practically the whole of Northern Rhodesia. Half of Lake Mweru, a corner of Lake Tanganyika, and the whole of Bangweulu lie in the northern corner of the territory.

Owing to the tsetse fly (*qv*) transport and farming are often carried out under great difficulty. However, a number of excellent arable and pasture lands exist which are not cursed by the scourge of this disease carrying insect. Lusaka, which had a population of 500 Europeans in 1931, has since become the new seat of government. It lies in the centre of one of the finest farming areas, where tobacco, maize, wheat, cotton, coffee, and various fruits are grown. Mining is carried on at Broken Hill and Ndola, where lead, copper, gold, coal, and other minerals are found. In a cave at Broken Hill a prehistoric skull, known as the Rhodesian skull, was found in 1921, it is believed to represent an extinct type of Man.

The Rhodesian Railway runs from Southern Rhodesia, across Northern Rhodesia, connecting up Livingstone (the old capital), Lusaka, Broken Hill and Ndola with Elizabethville in the Belgian Congo. Until 1923 Northern Rhodesia was under the administration of the British South Africa Company, but it is now a Crown Colony,

under a Governor. Barotseland, the most western portion, however, is kept as a native reserve. Sixty miles south of Lake Bangweulu there is a memorial to David Livingstone (*qv*), the missionary explorer, at Chitambo. The area of Northern Rhodesia is 290,300 square miles, it is populated by 1,331,200 natives and 10,000 whites.

Southern Rhodesia is bounded on the north and east by Mozambique, on the south by the Transvaal, and on the west by Bechuanaland Protectorate. The Zambezi and Limpopo rivers form the northern and southern boundaries, respectively, and together with their tributaries and those of the Sabi and Lundi they drain most of Southern Rhodesia. Two-thirds of the territory is over 3,000 feet high.

There are huge areas of very fertile land, where tobacco, maize, and fruit are grown. Much land is laid down to permanent pasture, and dairy farming is carried on extensively. Salisbury, the capital, with a white population of 7,200, is in one of the finest agricultural areas and is also the centre of a prosperous gold-mining district. Other important mineral resources are silver, asbestos, chromium, iron, coal, and diamonds. There are iron and brass foundries and numerous smaller industries.

New Roads and Railways

In 1935 a single span road bridge 1,080 feet long was built across the river Sabi to open

up the fertile Mafeking district. This was the first bridge of its kind in the British Empire, and at the time of construction had the third longest span in the world. The Rhodesian Railway from Livingstone crosses the Zambezi at the famous Victoria Falls (*qv*), passing through Wankie to Bulawayo. From here, one line connects up with Mafeking and Cape Town, and another runs up to Salisbury. Bulawayo is thus one of the key towns of southern Africa.

As in the case of Northern Rhodesia, Southern Rhodesia was under the administration of the British South Africa Company until 1923. Then it became a self-governing community, headed by a representative of the Crown. It comprises the native territories known as Mashonaland and Matabeleland. The area of Southern Rhodesia is 150,300 square miles, with a population of 1,376,900 of whom 58,870 are Europeans.

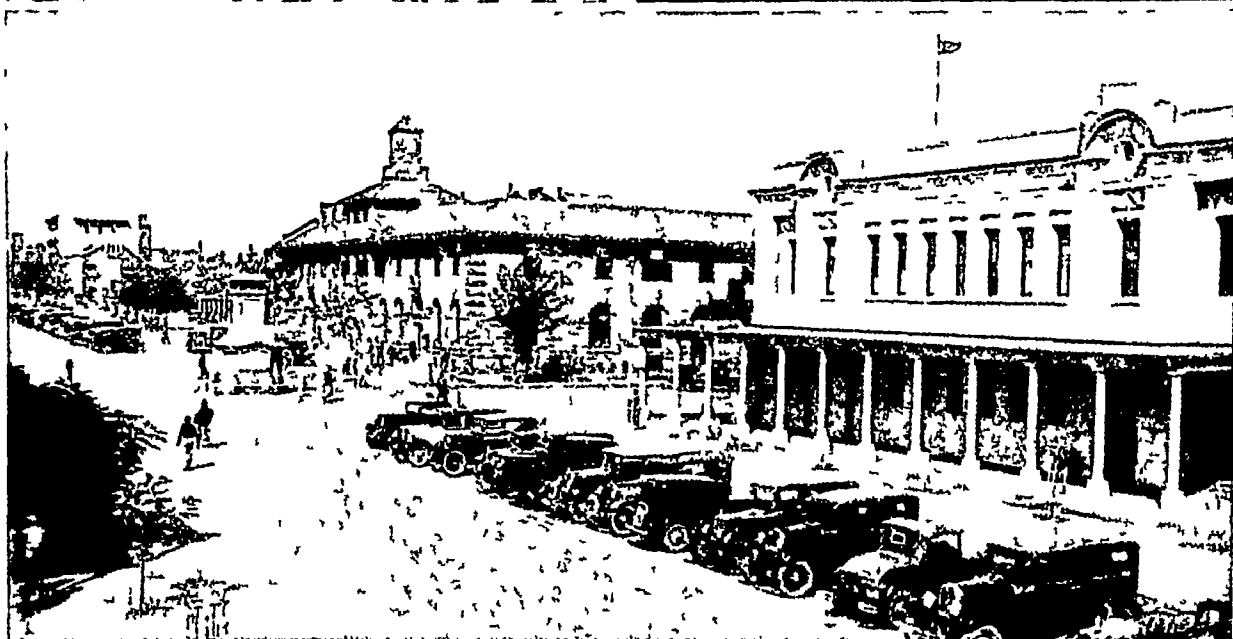
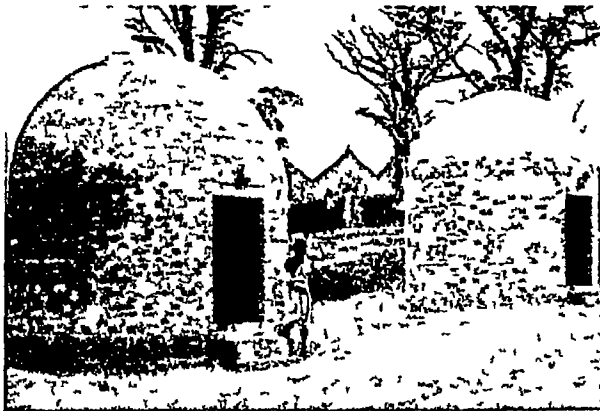


RHODESIAN RELIC

Conical towers, such as that above, are notable features of the ruins of Zimbabwe, in S Rhodesia. They are relics of a long-forgotten civilization. Though no mortar or cement was used in constructing them, the granite blocks are so carefully placed that a knife-blade cannot pass between them.

Photo courtesy of Government of Rhodesia

A VISIT IN PICTURES TO TROPICAL RHODESIA



The whole of Rhodesia is tropical, but lies at a considerable altitude, so that generally the climate is healthy and agreeable. Our photographs show top, a tobacco plantation, left centre, a native village in the Matoppos Hills, the range in which Cecil Rhodes lies buried, right centre, by way of comparison, modern huts built completely of brick in a native compound. The bottom photograph shows the main street of Bulawayo, the commercial capital of Southern Rhodesia. The monument commemorates the native rebellion of 1896. Not many years ago Bulawayo was the headquarters of the warlike Matabeles, and its name means "the place of killing" or "the pathway of blood."

Photos by courtesy of the High Commissioner for Southern Rhodesia

RHODODENDRON

A movement is afoot to combine the Rhodesias with the Nyasaland Protectorate (area 39,000 sq miles, pop., 1,396,000) which lies between Northern Rhodesia and Lake Nyasa. Nyasaland's capital is Zomba (white pop., 250). Blantyre has 7,000 whites.

Rhododen'dron. Throughout early summer the gorgeous blossoms of the rhododendrons beautify our gardens. Our woodlands, too, are brightened with the blooms and shining foliage, for the common species (*Rhododendron ponticum*) provides excellent cover for game, and has been planted in many places, being now more or less naturalized.

The rhododendron is not a native of Britain, for it was introduced into this country about the middle of the 17th century. Besides the species native to the mountainous parts of Europe and North America, there are others found in Asia, especially in the Himalayas, Java, and Borneo.

These handsome plants are cultivated widely and with great success as garden shrubs. Many of the choicest varieties have been obtained by crossing the ordinary purple flowered rhododendron with the more brilliant Himalayan and American kinds, and these, too, are often grafted on to the more common types.

The rhododendron belongs to the order *Ericaceae*, the family of the heather and of the *Azaleas*, the rhododendron's closest relatives.

Rhône, RIVER. Since the earliest days of civilization this picturesque waterway, which enters the Mediterranean near Marseilles in France, has been one of the principal avenues of commerce leading from the Mediterranean across what is now France to the Rhine on the one side, and to the North Sea coasts on the other. Phœnician traders received the tin of Britain by this route, the Romans made of it the avenue of Caesar's conquests, Saracen bandits, crusaders, and traders poured along this way in the Middle Ages, and today its long strip of navigable waters and the canals which connect it with the Loire, the Seine,

and the Rhine make it one of the great water-routes of Europe.

Springing as a torrent from the foot of a great glacier high up in the Alps of southern Switzerland (nearly 6,000 feet above sea-level), and swollen by many mountain streams, the Rhône dashes down through wild gorges and flows south eastward through the broad, beautiful valley between the Bernese Alps and the towering Pennines. Picturesque old villages and thriving little towns cluster along its banks, and in the distance the Great St Bernard

and the Matterhorn look down upon it as it rushes swiftly through this beautiful region.

At Martigny, 75 miles from its source, the river turns sharply to the north west and, flowing through a wide, marshy plain, pours into the Lake of Geneva. There it leaves all the impurities gathered in its turbulent course through the mountains, and issues from the southwestern extremity of the lake, limpid and clear as crystal. But half a mile below Geneva, the Arve, which descends from the glaciers of the Mont Blanc region, pours its turbid waters into the Rhône. Twelve miles west of Geneva the Rhône enters French territory and passes through narrow gorges round the southern spur of the Jura Mountains, receives from the



Kodak Snapshot

RHODODENDRON IN FLOWER

This lovely evergreen flowering shrub provides a brilliant display of blossom in May and June, and is easy to grow if planted in lime free soil. Above are flower clusters of one of the numerous beautiful varieties.

north the waters of the Ain, and then flows freely westward to Lyons.

Thus far a huge and unruly mountain torrent, it there receives the Saône, its principal tributary, and, turning southward, becomes one of the great historic rivers of France, flowing through a land of romance and poetry, of vines and olives, of old Roman temples and papal palaces. Between Lyons and the sea, a distance of 230 miles, the steep slopes above the river are everywhere covered with rich vineyards.

Along its left bank lie such historic cities as Vienne, Valence, Avignon, Tarascon, and Arles, and on that side the Isère, the Drome, and the Durance rivers, bringing down the melted snows from the lofty Dauphiné Alps, add their waters. On the west the Ardèche is the only important

tributary About 25 miles from the Mediterranean the Rhône divides into two main branches—the Grand Rhône, running south-east, and the Petit Rhône, flowing south-west—and thus discharges its waters into the sea

The total length of the Rhône is a little more than 500 miles, of which the Lake of Geneva claims 45 But it is by means of canals branching off from the course of the Saône that the Rhône communicates with the basins of the Loire, Seine, Rhine, and Moselle

Since 1926 Marseilles has been connected with the Rhône by a ship canal

Rhubarb. The acid fruit from the long juicy leaf-stalks of the rhubarb plant (*Rheum raphaniticum*) is among the earliest products of the garden in the spring It is popular, too, for jam, as well as for tarts, often when mixed with other fruits

Rhubarb requires a rich soil, and the wise gardener will force early growth by putting fertilizer around the roots in the spring Placing an old drain-pipe or other cover over the plants causes them to shoot up rapidly, and that is why you see so many such objects in the kitchen garden in spring Beneath such devices the young rhubarb is being forced to produce tender, sweet stems earlier than it would normally

Rhubarb is a member of the dock family, and has large, heart-shaped leaves, sometimes a foot across Cultivation has greatly improved the plant, making the stems less woody, with thinner skin and better flavour than those of the wild plant Rhubarb, moreover, is not allowed to flower in cultivation The roots of certain species are employed in medicine both as a tonic and as an aperient

RICE from PADDY-FIELD to PUDDING

Though we know it only as an ingredient of milk-puddings or as an accompaniment to some meat dishes, to millions in the East rice is the staff of life, without which they would starve

Rice. It is a hot sultry day in far-away Japan, exactly the sort of weather that suits the moisture-loving rice plant On the top



of a little mud wall stands a thin, yellow-skinned man, clad only in black cotton trousers and a big woven reed hat He is a patient, hard-working Japanese farmer He leans his weight on a wooden cross-piece in a queer kind of rectangular framework that rests on the top of the wall, with his feet he operates

a treadmill which turns a water-wheel with little cups or paddles set in its circumference This raises the water from the ditch below and spills it into the field, which looks just now much like a big mudpie

Tomorrow the tiny rice plants will be transplanted into this "paddy"-field from a similar but smaller muddy field in which the seed was sown three or four weeks ago

Very early next morning the whole family arrives—father, mother, the older children, and perhaps some outside helpers, three or four chubby, little, round-faced babies, and grandpa, who has come along for an outing Bare-footed and with trousers rolled to the knees, all but the babies and grandpa wade into the oozy mud and begin setting out the young plants in rows about 18 inches apart The last part

of the day's task is to flood the field, for growing rice prefers to spend most of its life in the water That is the reason the field must always be walled

Hot, wet weather makes the young plants shoot up fast, but weeds also grow rapidly Sometimes the natives wade into the water and pluck out the weeds with their toes as neatly as you could with your hands, but usually whenever weeding is needed the field is drained Then there is more work at the treadmill, until there is again enough water in the field to float the leaves When the leaves begin to change from green to yellow the water is drawn off for the last time The grain then ripens rapidly in the sun Some varieties of rice mature in three months, others require a longer period of from four to six months

Machinery has no part in the harvesting of this crop The straws are cut with a hand sickle, a handful at a time Threshing is in most parts an equally simple process, just pulling the heavily-laden heads through a saw-toothed frame placed over a tub or cask No part of the crop is wasted, the straw is used for making hats, sandals, matting, and bagging The roots are burned and used as fertilizer

To get rid of the outer husk the grain is beaten with flails The tight-fitting inner covering is then loosened in little hand-mills For hours at a time women and children squat on the ground shaking the mixed grain and chaff up and down and to and fro in shallow reed baskets, so that the wind may blow the chaff away

Rice furnishes the principal food of one-third of the world, and is grown most profitably and

THE PICTURE STORY OF A GRAIN OF RICE



1 Sowing out the Young Plants



2 Off with Their Heads Threshing

4 Removing the Chaff

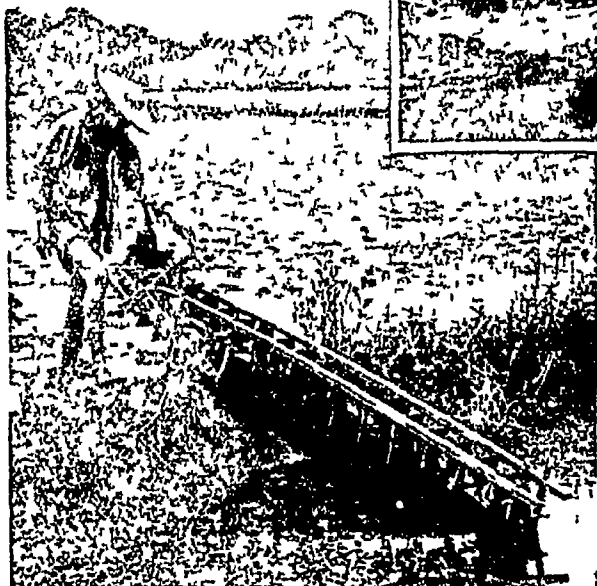
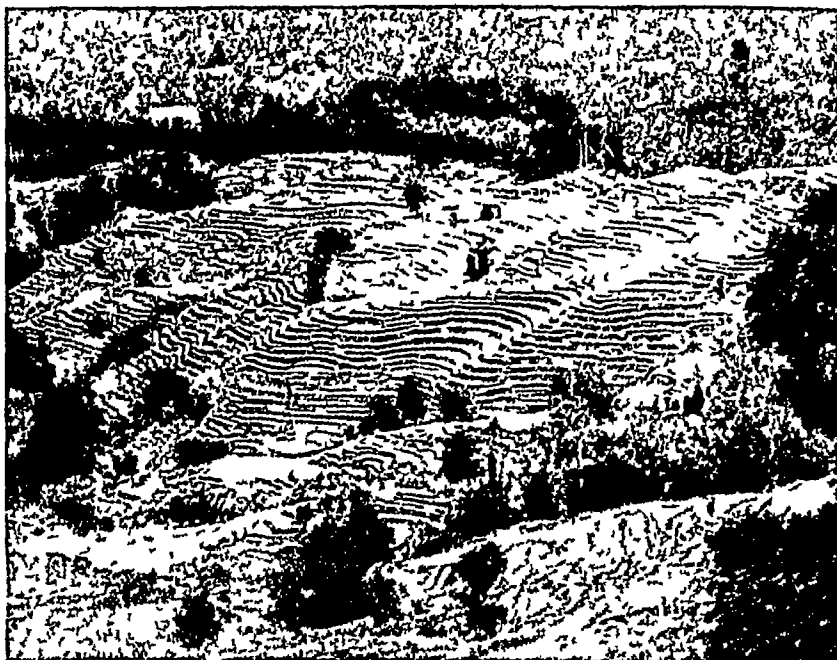


3 Pounding off the Husks

5 Testing the Packed Rice

Here we see how the patient labourers of Japan, working by methods that seem primitive to Western farmers, cultivate, harvest and prepare for market the rice crop—the great staple food of the Orient. And yet such methods produce 97 per cent of the world's supply of this widely-used food—three thousand million bushels!

easily on low river flats subject to frequent inundations, which leave behind them a deposit of rich alluvial soil. For that reason it is the main crop along the lower Yangtze in China, the lower Ganges in India, the delta of the Irrawaddy in Burma, in Siam and French Indo China, and on the banks of the Egyptian Nile. All these districts possess also the other requisite of successful rice-growing, a long warm growing season.



IRRIGATING THE PADDY-FIELDS

To grow rice the land needs to retain water on its surface, so in Ceylon, as you see in the photograph above, the hills are scarped to form shallow dams of earth which hold the water. Left, we see a primitive water-wheel, as used in China.

Photos left Dorien Leigh top E N A

But in most of the countries of Asia there are so many mouths to feed that every available foot of land, no matter how inaccessible or how difficult of irrigation, must be utilized. Impossible-looking mountain sides are therefore levelled into little terraces like shelves, and the water dropped in ditches from one level to another until out-cropping of rock or sheer cliffs ultimately block the way.

In India, Burma, the Philippines, and the Malay Peninsula the work of preparing the soil is a little easier. The water buffaloes drag the plough over the fields, or travel all day long in a circle supplying power for a pump that is at least one step in advance of the Japanese treadmill. The Indian plough is more often than not a crooked stick, which only scratches the surface, but the Burmese farmer usually has a wooden plough and harrow.

The cultivators of the Orient raise 97 per cent of the world's supply of rice.

Rice (*Oryza sativa*) is one of the most important of the cereal grasses. As a food, rice is three-fourths starch. In the brown skin that is polished

away in the milling process there are valuable mineral salts and vitamins, without which a diet chiefly of rice often produces a disease called "beri-beri", in any case the rice diet tends to produce a small, though hardy, race. Fortunately the peoples of the Orient, who live chiefly on rice, do not as a rule use polished rice. A large proportion of the rice brought to Europe is made into starch. Some of it is used by distillers of alcohol. The national drink of Japan, a spiritous liquor called *saké*, is prepared from rice by a process of fermentation.

Rice Paper. In the swampy forests of the beautiful and fertile island of Formosa, in the western Pacific Ocean, grows a shrub which belongs to the natural order *Araliaceae*, and whose scientific name is *Fatsia papyrifera*. It grows some 8 feet high and has large downy leaves and masses of green flowers. It is from the pith of this tree that rice paper is made.

People in Europe used to think that this paper was made from rice, and that is how it came to be called rice paper.

Rice paper is very delicate in texture and takes inks or paints well, and for this reason artists in the East often use it for their paintings, while it is the paper largely used for the printing of wood engravings. Dyed rice paper is also widely used in making artificial flowers.

The manufacture of rice paper is simple. First, the pith is taken out of the stem of the tree and placed on a hard flat table or other surface. It is then rolled round and round against a long sharp knife, which cuts it into very thin slices. These form rice paper.

Three RICHARDS on ENGLAND'S THRONE

Violently contrasted were the characters of our three King Richards—the first a romantic and daring Crusader, the second a pathetic figure of an inexperienced boy, and the third a cruel and designing villain

Richard. KINGS OF ENGLAND It would be hard to find more widely contrasting types than the three Richards who have sat on the English throne

RICHARD I (1157–1199), called the Lion Heart (*Coeur de Lion*), who ruled from 1189 to 1199, was more than six feet in height and fair-haired and blue eyed. He was a splendid fighter, the greatest of his day. He was a poet also, but as a king he was too careless of his duties to be called a good ruler.

Richard grew up wholly under French influences. Both his parents, the energetic Henry II and the forceful and passionate Eleanor of Aquitaine, were of French birth and education. His father was the first Plantagenet King of England, but his possessions in France were greater than all England.

French was the language of the Plantagenet Court, where gay troubadours and minstrels were always welcome. French was Richard's

native tongue, and almost all his life was spent in France, even after he became king he made only two brief visits to England.

At the age of 15 Richard was formally placed in charge of his mother's duchy of Aquitaine, in southern France. Next year he joined his brothers, aided by the French king, in a widespread but unsuccessful revolt against their father (1173). He also engaged in struggles with his elder brother Henry and his younger brother John. The death of his brother Henry (1183) made Richard the next heir to the throne, to which he succeeded on the death of his father in 1189.

News of the recapture of Jerusalem by the Mahomedans, two years before, had stirred all Europe, and great preparations for the Third Crusade were already on foot. For Richard this proved the great undertaking of his life. After a brief visit to England, to be crowned and to provide for the raising of money for the



RICHARD COEUR DE LION EMBARKS FOR THE CRUSADES

This fine decorative painting by Glyn Philpot hangs in the Houses of Parliament. It depicts King Richard the Lion Heart starting out in 1190 on the Third Crusade. Great both in stature and personal prowess, Richard I owes his fame to the numerous ballads and romances later woven about his exploits. Actually he was arrogant, cruel, and rapacious and was fit only for warfare. The drain of money required for his wars left England in dire misery.

government in his absence, Richard returned to the Continent to complete his preparations

The English fleet sailed by way of Gibraltar to Marseilles, while Richard journeyed overland to the same port. He joined King Philip of France at Sicily, where they spent the winter, not without quarrelling violently. Richard again turned aside on the way to the Holy Land to fight with the ruler of Cyprus. He finally joined Philip at the siege of Acre, which surrendered in July, 1191.

Because of his military skill and courage, Richard was soon acknowledged as chief leader of the Crusade. But King Philip returned to France, to plot against his rival. For more than a year Richard remained in Palestine. When he fell ill of fever, it is said that his great opponent, Saladin, the chivalrous leader of the Mahomedans, sent him fruit and snow. "He was brave," says an Arab writer, "experienced in war, and fearless of death. If he had been alone among millions of enemies, he would not have declined battle, when he attacked there was no resisting."

Twice the Crusaders were within two days' march of Jerusalem, but were unable to take the Holy City. At last Richard negotiated a truce for three years, under which the Christians were permitted to visit the Holy Sepulchre in safety. He sailed for home in October, 1192.

King Philip and Richard's brother John were plotting against him, and when Richard was

forced to land at the head of the Adriatic Sea he found himself a hunted man. In disguise he reached Vienna, the home of his worst enemy, Leopold, Duke of Austria. When detected, he was arrested and imprisoned. A beautiful story tells how his minstrel Blondel discovered his whereabouts by singing under the windows of many castles until he heard Richard's reply.

Last Years of Coeur de Lion

Money for Richard's ransom was finally raised, and he was released in February, 1194. Hastening to England, he found John's attempted revolt already crushed. John himself was forgiven. The remaining five years of Richard's reign were spent in constant fighting with Philip, and in building his castle, called the Château Gaillard, in Normandy, as a protection against France. The government of England was left chiefly to administrators trained by his father, Henry II. Richard died as he had lived, fighting. While besieging a castle in southern France, he was wounded by a cross-bow bolt in the shoulder, and died a few days later.

Even during his lifetime Richard's deeds were the subject of song and story. In later times they have been treated by Sir Walter Scott in his novels "Ivanhoe" and "The Talisman." A truer picture of Richard is given by Maurice Hewlett in his novel "Richard Yea and Nay."

RICHARD II (1367-1400) was the son of the "Black Prince," who fought so courageously at Crécy and Poitiers in the reign of Edward III,

his grandfather. The death of Edward III in 1377, following that of the Black Prince the year before, made Richard king when he was only a boy.

His character and his reign were full of contrasts. At one time he would face a mob with courage and coolness, at another he would give way to furious fits of passion. At one period he ruled with great moderation and won popularity, at the end of his reign he became so tyrannical that he was deposed.

During Richard's minority there were quarrels between the great nobles who struggled for power, and also religious dissensions growing out of the teachings of John Wycliffe (See Wycliffe, John). In the formidable Peasants' Revolt in 1381, according to one account, the 14-year-old king rode boldly forth to confront the angry rebels when they found themselves betrayed and



THE TRAGEDY OF RICHARD II

In 1399 Henry of Lancaster, taking advantage of Richard II's absence in Ireland, landed in England and made a bid for the crown. On August 19 Richard surrendered to Henry at Flint, as shown in this quaint drawing from an ancient manuscript. Richard was imprisoned in Pontefract Castle, where he died or was murdered in 1400.

British Museum. Harleian MS

RICHARD

their leader slain, and cried "What need you, my masters? Would you shoot your King? I will be your captain" (See Tyler, Wat)

It would take too long to tell in detail the story of the political struggles which filled the remainder of Richard's reign—of how Parliament appointed a commission to guide the King's rule, how the judges declared that the leaders of Parliament had committed treason, how those leaders raised an army and defeated the King's forces, and the "Merciless Parliament" then hanged or exiled the King's friends, how the King suddenly declared himself of age, ruled wisely for eight years, and then put to death or banished his worst enemies, and how he surrounded Parliament with his archers and compelled it to grant him greater powers than any other English King had ever had

This triumph but paved the way for his downfall. Richard's cousin, Henry Bolingbroke, son of John of Gaunt, Duke of Lancaster, was one of the opponents whom Richard had banished. In 1399 he returned to England with a few followers to recover his inheritance, which Richard had unjustly seized. His followers rapidly became an army, Richard II was defeated and forced to resign the crown, which was then conferred upon Henry Bolingbroke, the first Lancastrian King (See Henry, Kings of England)

The deposed king was kept for a time in the Tower of London, and then removed to the castle of Pontefract, in Yorkshire. When a rebellion broke out in his favour, in January, 1400, Richard was either murdered in his prison, or it may probably be that he died a natural death. The story of Richard II is told in Shakespeare's tragedy of the same name, and in Gordon Daviot's play, "Richard of Bordeaux."

RICHARD III (1452-1485) was a Yorkist prince who was so ruthless and unscrupulous that his character is painted in the blackest of hues. In after times Shakespeare in his "Richard III" represented him as crook-backed and morally a

monster. He certainly seems to have had some physical defect, but he was apparently of average height and build and not ill-looking.

He grew up, however, in the midst of the civil strife which preceded the Wars of the Roses, and at a time when the tyrants of Renaissance Italy were setting examples of government by intrigue, poison and assassination. While naturally calculating and distrustful, Richard could be very engaging. He was able and hard-working, but his merits have been forgotten because of the way in which he won his crown.

When his brother, Edward IV, died, Richard of Gloucester (as he was then called) saw a chance to win the throne. Already he was suspected of murdering the Lancastrian Henry VI and the latter's son to secure the crown for Edward IV. Suspicion also pointed to him as the slayer of his brother the Duke of Clarence.

Now there stood between Richard and the throne only the two little sons of Edward IV, the eldest of whom, Edward V, was not 13 years old. Richard secured control of both boys and had himself declared Protector by the Council. He then spread charges that the late King's marriage had been illegal and that his sons therefore had no right to rule. A packed assembly, summoned in place of the regular Parliament, thereupon asked him in 1483 to take the crown as Richard III.

Installed as king, Richard III sought to make himself popular, but it was noted that those who stood in his way were soon got rid of. First it was Lord Hastings, an old officer of Edward IV's, who was accused of plotting and instantly executed. Then the two uncles of the little princes, brothers of their mother, were put to death on charges of treason. Finally the two little princes, whom Richard had imprisoned in the Tower of London, disappeared, and it was rumoured that they had been murdered.

The disappearance of these two young princes turned the great mass of Richard's subjects against him. For two years he maintained



RICHARD CROOKBACK

Richard III won his throne by crime, and tried to maintain it by terrorism, but disaffection bred rebellion, which ended with the death of the king on the field of Bosworth, August 22, 1485. Though unscrupulous, he was intellectual and brave.

National Portrait Gallery

himself upon the throne, but he lived in uneasy fear, and his hand was always on his dagger when he rode abroad

Then in 1485 Henry Tudor, Earl of Richmond, who as the last male representative of the Lancastrians had a claim to the throne, prepared an expedition in France, which, having landed in the west of England, soon rallied supporters to his cause. Richard then advanced to meet the invader at Bosworth Field.

Although a large portion of his troops withdrew or went over directly to the enemy, Richard fought with terrific courage. Deserted, and surrounded by his enemies, he struggled on until he fell pierced with wound upon wound. That same day the victorious Tudor was crowned Henry VII with Richard's battered crown picked up from the battle-field.

Richelieu, CARDINAL (Pron *rēsh'-lyē*) (1585-1642) No more striking figure can be found in all the dramatic history of France than that of Armand Jean du Plessis, Duke of Richelieu, who, in his capacity of chief Minister of State, controlled for nearly 20 years the destinies of France, and raised her to the position of the foremost power in Europe.

Haughty, stern, ruthless, implacable, the great Cardinal is a figure that kindles the imagination and has been the theme of countless paintings, dramas, and romances. Even when he was wasted with disease, such was the force of his will and the majesty of his bearing that he overawed all, including the king.

He loved the privileges and trappings of power, living in royal state, and forcing even princes to yield him place. Not even the most powerful noble in the realm dared to stand against him. Every whisper of plot or discontent, every piece of gossip, was brought to him by his scores of spies.

Richelieu became a bishop at the age of 21, and a cardinal at 37. His attention to the affairs of a small bishopric, however, did not interfere with his watchful search for a larger field of endeavour. He longed for political

power, and his ambition was realized in 1624, when he became chief minister of France. From that time until his death he was so completely master of the country that he quite obscured the personality of the weak King, Louis XIII, whose chief claim to greatness lies in the fact that he kept his great minister in power regardless of personal dislike and Court intrigues against him.

When Richelieu entered the royal service his aim was, as he once told Louis, "to employ all my efforts and all the authority which it might please you to give me, to ruin the Huguenot party, to lay low the pride of the nobility, and



RICHELIEU AT LA ROCHELLE

By his statecraft Richelieu raised France to be the most important state in Europe. He crushed the Huguenots at the siege of La Rochelle, less on account of their religion than because of their dangerous disruptive tendencies, and he showed great wisdom in allowing them to retain religious and civil privileges. This painting, by Henri Motte, is in the Museum of La Rochelle.

to raise your renown among foreign nations to the point at which it ought to be."

In 1628, after a year's siege, he took from the Huguenots the town of La Rochelle, their principal fortress. This marked the end of their political power, although they still retained freedom of worship and civil rights.

To humble the nobles was a more difficult task, but the ruins of many of the medieval castles throughout France bear testimony to the thoroughness with which Richelieu carried out his work. All fortified places not necessary to repel invasion he ordered to be dismantled or destroyed. He also appointed royal officers to oversee the governors of the provinces.

The opportunity to carry out his third design was furnished him by the religious and political wars of Germany (See Thirty Years' War). Richelieu aided the Protestants of Germany

in their long struggle against Spain and the Emperor, at first by furnishing their ally, Gustavus Adolphus of Sweden, with financial aid, and then later by engaging actively in the conflict. By this policy France was, at the conclusion of peace in 1648, the foremost power in Europe. Among other territorial gains, she had added to her domain Alsace, which later became one of the "lost provinces," restored to her by the World War of 1914-1918.

Richelieu did not live to see the conclusion of the Thirty Years' War, but his work was ably carried out by his follower, the wily Mazarin. The war had cost France dear in men and money, and when Richelieu died he was the most hated man in the country. But he had achieved his ambitions. "His fame," says a French writer, "is cherished because he secured for France glory and power, and a foremost place among European nations."

Richelieu also made himself an imperishable place in the literary annals of France by fostering the great writers of his day and by founding the French Academy. (See illustration p. 1725)

Riddles. "In at every window and every door crack, round and round the house and never a track." Can you guess this riddle? Your grandmother at your age probably guessed it, and her grandmother before her. These puzzling questions, called riddles, have always been popular, and the wind has always been a favourite subject. The Wolof natives of Senegal ask "What flies for ever and rests never?"

Riddles, like fables and folk stories, belong to all races and ages. Their guessing is an ancient game in which high prizes and heavy forfeits have been paid. The Bible has many of these old time riddles. You will find them among the proverbs of Solomon, and in the fourteenth chapter of Judges there is a curious story of the riddle that Samson proposed to the Philistines. Among the ancient Greeks also the riddle was popular. It is found in the writings of their famous poets. Homer himself, legend says, died of vexation because of a riddle that he could not guess.

Among the well known myths of Greece is the story of the Sphinx, a strange monster that crouched on a hill above the city of Thebes, waiting to devour men who passed by if they could not answer this riddle, which she put to them: "What is that which has four feet in the morning, two at noon, and three at night?" At last, after many of his countrymen had perished because they could not guess it, there

came Oedipus, who answered, "Man. As a baby he creeps on hands and knees, in mid-life walks on two feet, in old age totters along with the aid of a stick, or third leg."

In the Middle Ages riddles were used merely as a pleasant pastime. Some have come down to us in an old collection called "Amusing Questions." It is well that solutions also are given, for who could guess such a riddle as "What is that that never was and never will be?"—the answer to which is, "A mouse's nest in a cat's ear." Pun riddles are among the cleverest propounded in these days. An example is "What is it that is black and white and red all over?" If "red" is spelled *read* it will give a clue, for the answer is "A newspaper."

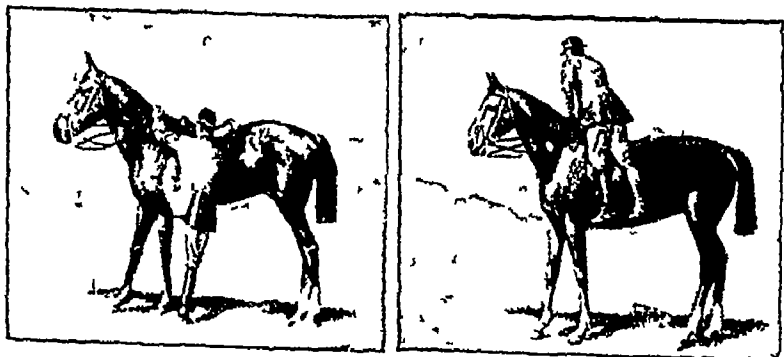
The conundrum is first cousin to the riddle. It is founded on some resemblance between unlike things or their names. "What kind of fruit does the electric plant bear?"—the answer being "currents" (*currants*). Or, "When is a door not a door?"—to which you reply, "When it is ajar" (*a jar*).

Riding. You have something really thrilling to look forward to if you have not yet had the experience of riding on horseback. And since you can never know all there is to know about horsemanship, you cannot begin too young. The earlier you learn to control a horse the better, both for you and the horse.

Much might be said about "hands" (the art of controlling a horse with the reins), but sensitive and responsive hands must be born in you. No riding master can teach you this or an understanding of the horse you are riding. Your "seat" in the saddle, however, must feel safe and firm in order to give you confidence, but it must be elegant, too. To achieve these points you would do well to remember the old rhyme:

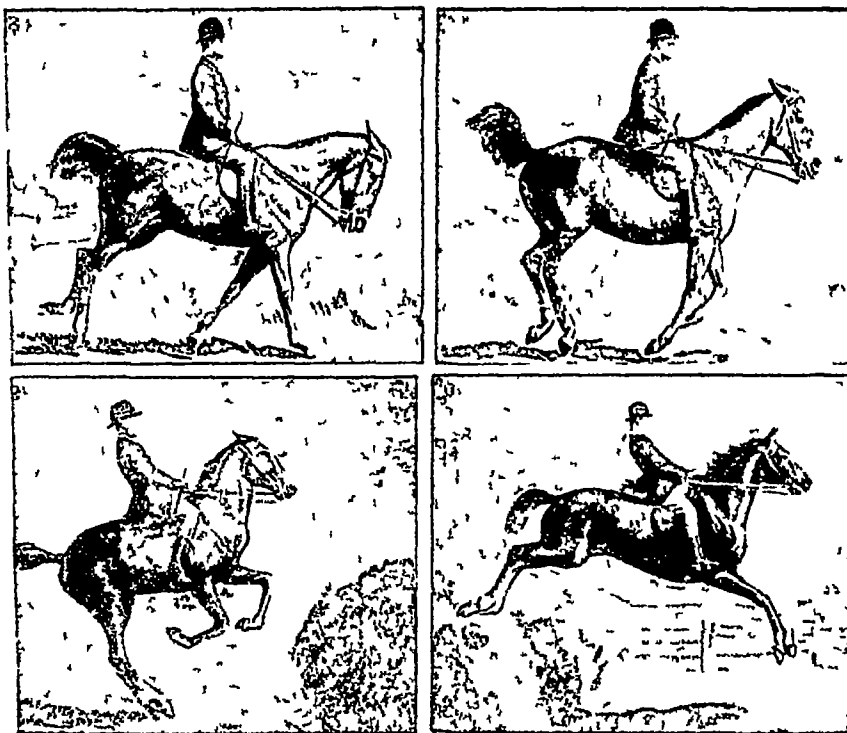
Your head and your heart keep up,
Your hands and your heels keep down.
Your knees keep close to your horse's sides,
And your elbows close to your own.

Another important point to remember is not to put your foot right into the stirrup.



RIDING HOW TO MOUNT A HORSE

In preparing to mount (left) the reins are first gathered in the left hand, which is placed on the pommel of the saddle. The left foot is next placed in the stirrup, and the right hand on the croup of the saddle. Then, by pulling on both arms and taking a good spring off the right foot, the body can be swung up into the saddle (right).



RIDING: THE CANTER AND THE JUMP

The top left drawing shows the start of the canter, and the right-hand one the full canter. In cantering the body should be kept straight, and the shoulders loose. Balance should be maintained by means of the knee grip, and not by the reins. Lower left, taking off for a jump, right, clearing the obstacle. In jumping the horse should be given his head and the rider should lean backwards to take the weight off the horse's forelegs as it lands.

(except when jumping), but to let the ball of the foot rest on the bar.

When you have learnt how to hold the reins and how to hold yourself in the saddle, a few days' walking practice will accustom your muscles to the new posture. It is better to do this without stirrups, gripping with your knees.

From the walk you can progress to the "canter." This is the easiest pace for your seat, but not for the horse. In cantering you must sit well up and learn to "give and take" with the motion of the horse. The "trot" is easier for the horse, but far more difficult for the rider, as he has to rise in the stirrup during one step, "bumping" the saddle gently on the next, and so on. For your horse's sake don't trot down even a slight slope, don't pull him up suddenly, and never lose your temper with him.

When you have acquired a good seat you will want to go on to jumping. For this you need to shorten the stirrups. As the horse rises to a hurdle, don't lean forward, but throw your body well back, gripping tightly with your knees. Should you happen to fall, remember to hold on to the reins at all costs, unless you are kicked. Falling safely is an art in itself. A knowledge of jumping is necessary to all who wish to ride to hounds. (See Hunting)

If you are keen to become a really good horseman or horsewoman, you cannot do better than join the nearest Pony Club, where able teachers

who love the horse will drill you very thoroughly in all the finer points of horsemanship. (See Horse)

Riga, (Pron *rē'ga*), LATVIA. Founded by German merchants of the Hanseatic League in the Middle Ages (1158), this city at the head of the Gulf of Riga—an arm of the Baltic—still has the air of a medieval German city, with its high warehouses, spacious granaries and cellars flanking narrow winding streets. In contrast, the suburbs are quite modern, with their wide boulevards and parks, flats, and cafés.

Riga stands at the mouth of the river Dvina, and before the Russian Revolution of 1917 was the trade link between Germany and the rich basins of the Dnieper and the Volga, with which it is connected by a system of inland canals. After the break-up of the Russian Empire it became the capital of the new inde-

pendent state of Latvia. There is no other city, and Riga is the industrial centre of Latvia.

The harbour of Riga is closed by ice in the winter. Besides the Latvian University, there are technical schools, an academy of fine arts, and one of music. The population, made up chiefly of Letts, Russians, Jews, and Germans, is about 385,000.

Rio de Janeiro, (Pron *rē'-ō-dā-zhan-ār'-ō*), BRAZIL. In all the world there is perhaps no more beautifully situated seaport than Rio de Janeiro, the capital of Brazil and the second greatest city of South America. Steaming into its harbour, you see a gigantic cone of rock—the celebrated "Sugar Loaf" (*Pão de Assucar*)—which guards the entrance on the left. On the right, hardly less impressive, is the frowning rock called Pico.

Passing these, you enter the pear-shaped bay, studded with lovely islands and surrounded by a wall of mountains of fantastic shape, most of them covered with tropical vegetation. Curving round the western shore of the bay, where all the navies of the world could ride at anchor, on a long but narrow strip of land lies Rio (as it is called for short), a mighty city of white spires and domes.

Leaving the steamer at the dock, you find yourself facing a stately thoroughfare, the Avenida Rio Branco, with rows of royal palms, and walks of fanciful mosaic designs lined with

great buildings of solid construction and modern architecture. At the end of this avenue you can turn into the Beira-Mar, a boulevard which follows the bay for miles from the centre of the city to some of its beautiful suburbs.

The parks are brilliant with tropical flowers and palms, and tall bamboos shield pedestrians from the heat of the sun. Other features of Rio are the Botanical Garden, where flowers from all parts of the world are cultivated, and the "Hunchback," or Corcovado, a hill from which you will enjoy a fine view. On the summit has been erected a statue of Christ.

Rio has been largely rebuilt during the present century, at enormous expense. Sanitary reforms have transformed it from a port dreaded by seafarers, because of the prevalence of yellow fever, to one of the most healthy of tropical cities. The harbour, naturally one of the finest in the world, was dredged to make a broad shipping channel along the face of the new great stone quay, deep enough for the largest steamers.

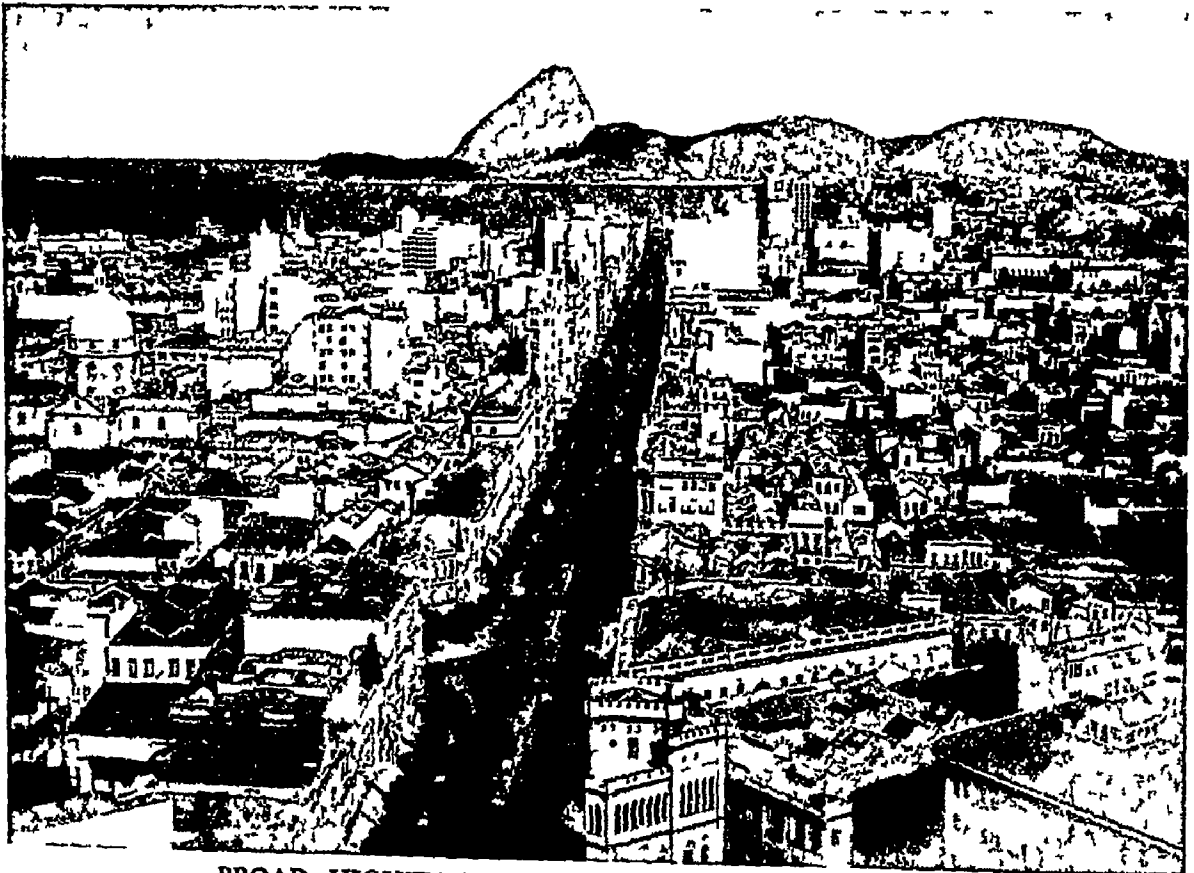
The city derives its chief importance from commerce. Coffee is the principal export, and imports consist chiefly of food and manufactured articles. The most important factories

are flour and textile mills. The city is an important airport for the South Atlantic services and others.

On the eastern shore of Rio bay is the city of Niotheroy, capital of the State of Rio de Janeiro. Here live many of the more well-to-do citizens of Rio ("Cariocas"). As a background to the bay are the magnificent Organ Mountains. The nearer suburbs of Rio itself include Copacabana, about 15 minutes by car from the centre of the city.

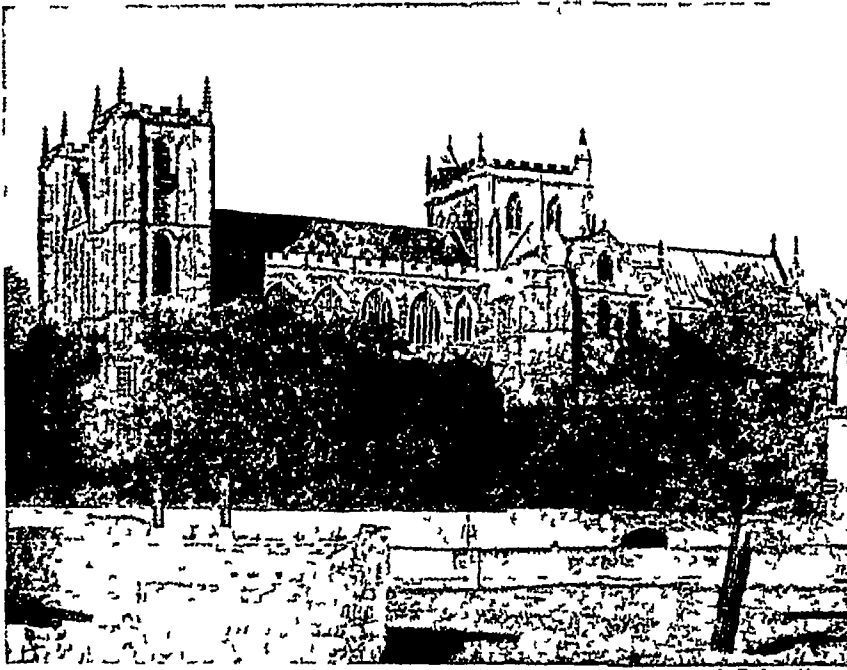
According to Portuguese writers, the name Rio de Janeiro ("River of January") was given to the bay by a Portuguese captain, who entered it in January, 1502, and thought that it was the mouth of a large river. Rio's population (including many foreigners) is about 1,848,000.

Ripon, ENGLAND The cathedral city of Ripon stands on the river Ure in the West Riding of Yorkshire, about 28 miles north of Leeds. The magnificent cathedral was built on the crypt of St Wilfrid's Abbey (founded in the 7th century). Until the year 1604 the city was governed by a wakeman and twelve elders (nowadays a mayor and twelve aldermen), the wakeman's house is still intact. Ripon is a spa, and has a pump room and



BROAD HIGHWAY JOINING RIO'S TWO SEA FRONTS

The fine Avenida Rio Branco runs right across the peninsula on which the main city of Rio de Janeiro is built, and joins the east and west sea fronts. It is nearly forty yards wide and over a mile long, and its tessellated pavements are shaded by trees. In the distance can be seen the famous Sugar Loaf mountain, which rises to a height of 1,200 feet on the opposite side of Botafogo Bay.



RIPON'S FINE CATHEDRAL

The old city of Ripon, in Yorkshire, has many interesting buildings, chief among which is the cathedral, seen above from the north-west. The building of it occupied three centuries, so that it is not surprising to find all styles of architecture represented in the structure. It was restored in 1862-72.

baths. The custom survives of sounding every evening at nine in the market square four long blasts on the wakenman's horn. Trading in agricultural produce is the chief occupation of the city, which has a population of some 8,600. Nearby are the ruins of Fountains Abbey.

Rivers. The importance of rivers to Man is seen in the great agricultural populations which their valleys and flood-plains support, and in the numberless cities that have grown up on their banks to take advantage of the transport facilities and water-power which they offer.

Their place in Nature is no less important. They drain the land of its surplus water and with it they carry to the sea countless tons of rock and mud and minerals. They are more important than all other agents in shaping land surfaces. They cut up high plateaux, creating magnificent rugged mountains, and in the course of ages they drop these mountains, bit by bit, into the sea. Aided by weathering, every river system is engaged in the task of carrying to the sea all the land of its basin which is above sea-level, but few, if any, rivers actually reach that goal, for the river itself passes through a cycle of evolution, from youth to old age. As it gradually cuts down its steep slope, it changes from a rapid stream in a narrow valley to a wide sluggish one with little erosive power, and it may take as long to wear away the last few feet above sea-level as all the other thousands of feet.

The *bed* of a stream is the surface upon which it flows, and its *banks* are the sides which hold

it in bounds. A *river system* includes a main stream and its branches, or the tributaries which flow into it. A *river basin* is the territory drained by the river and all its tributaries. A *divide*, or *watershed*, is the high land between two rivers which causes the ground water to flow towards both streams. Where a river enters the ocean on a sunken coast-line, the sea "backs up" into the mouth and it becomes a "drowned" river, a V-shaped bay, called an *estuary*, is thus formed. Many important harbours are large estuaries.

A really well-developed river system has as many sources as a tree has branches, all of which ultimately reach the trunk that empties into the sea. The water of rivers, furnished by rain and snow, comes at first from the sea

by evaporation, or in less degree from lakes and other rivers. When rain falls on an uneven slope it is gathered into many little rills, which follow the depressions in the surface, and immediately gorge-making begins. Much rain, especially upon level ground, soaks into the soil, but later oozes into the river when it has cut its channel deep enough, or comes up to feed streams in the form of springs. Those rivers which do not have access to ground water have usually only an intermittent flow, unless they rise in snow or ice fields or are fed by lakes.

At its source in the mountains the bed of a stream is steep and the swift river tears away everything that is in its path, causing rapids where it rushes over a rocky bed, or high water falls when it tumbles over cliffs. As the river leaves the mountains, however, the gentler slope of the land makes it less rapid and gives it power to carry only small stones, gravel, and mud. Near the ocean the slope of the bed diminishes still more, and the valley becomes a wide plain, in which the river swings to right and left in great curves or "meanders" (so called from the very winding river Maeander in Asia Minor), laying down most of the burden which is gathered in the mountains.

As the flowing river unites with the standing water of the sea, even the finest mud sinks to the bottom, and a plain is built up called a "delta," from its resemblance to the Greek letter Δ . At times of heavy rains or in the spring, when the snow melts rapidly, the shallow channel in the lower course of a river is unable to

RIVERS

contain all its water, which then spreads over the surrounding country like a vast sheet. When the water subsides it leaves behind a thin layer of sediment, which in time builds up a broad flat "flood plain," where the soil is extremely fertile. High levees (banks) are often built along such rivers to protect the surrounding country. But such control is not permanently successful. (See also *Physiography*, Valley, separate articles under the names of the various rivers, and list of the world's longest rivers in the Fact Index.)

Roach AND OTHER COARSE FISH The roach is one of the commonest of all our freshwater fish and one of the most popular. For though, like the other "coarse" fish, it does not make especially good eating, it is the subject of some of the keenest angling in the world. It is not usually heavier than two pounds.

The roach (*Leuciscus rutilus*) is a member of the carp family, and is a deep, flattish fish, dark green on the back, silvery below. Its fins and eyes are reddish, and the tail is deeply cleft. These fish live in shoals, spending the summer months in the shallows, where it is warm, or among the weeds alongside a swift run of water. Into this they dart to pick up food, which consists of grubs, berries, insects and almost anything that comes their way. They are as a rule bottom-feeders, but sometimes they come and feed on the flies at the surface, and in winter, when there are floods, they nose their way along the banks, often out of the river and over the flooded meadows.

Fishing for Roach

Roach fishing is a most specialized branch of angling, for in many places the fish have become very "educated" and are exceedingly wary. Various styles have been evolved in different parts of England, as in the Thames, Norfolk Broads, and the long, slow fen streams of the Midland counties. The types of rod used vary, some are very long, without a reel but with a fine line fixed to the tip. These require great skill for the handling of quite small fish. In another style, known as the Nottingham, a large reel without a check is employed, and in another method a "roach pole," seventeen feet in length, is used with tackle so fine that even a dry fly trout fisherman would not use it. Matches between rival clubs arouse intense interest.

A close relative of the roach, but less common, is the rudd (*Scardinius erythrophthalmus*), which is found in lakes as well as in rivers. It has even redder fins and tail, and is distinguished by the fact that the dorsal fin—the big one of the back—is set farther back than that of the roach.

With the roach is also classed the dace (*Leuciscus leuciscus*), for though you are not likely to confuse the two fish, you will almost always find the one where you see the other.

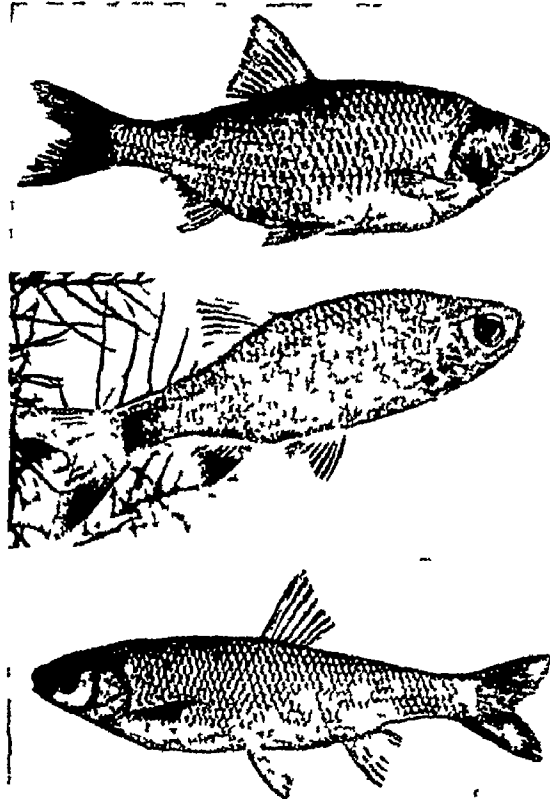
ROACH

The dace is smaller than the roach, and one weighing a pound is a "specimen" fish. It is silvery grey, and frequents the fast, clear chalk streams and the quicker runs of other rivers. It is one of the few members of this tribe to take a fly readily.

The very reverse is the case with the tench (*Tinca tinca*), yet another member of the group. This is a sluggish fish, very deep in the body and fat, deep greenish in colour, with large, rounded fins and tail. It lives a sluggish existence at the bottom of muddy lakes and ponds, and reaches a large size. One of the largest recorded tench was an old fellow that had taken up his position in a hole beneath the roots of a tree, where he grew so fat that he was unable to escape. When the pond was drained, there was the tench, held a prisoner in his own home!

The chub (*Leuciscus cephalus*), which may weigh several pounds, is a fine sporting fish, taking a fly readily and being much sought after by anglers, it is like a large dace with red fins.

Further members of this group are the gudgeon, and the loaches, all of them long, slender little fish which have small sensitive barbels below the lower jaw, and which feed on the bottom. Finally, there are the bleak, a small dace like fish, and the ubiquitous minnow.



ROACH, RUDD, AND DACE

These three members of the carp tribe have an obvious family relationship to one another. The roach (top), one of our commonest freshwater fishes, has the dorsal fin placed further forward than the rudd (centre), while the dace (bottom) is much slimmer than either of these.

Photos top and bottom H. H. Goodchild centre S. C. Johnson

The STORY of the KING'S HIGHWAY

*There is a romance in the story of roads, perhaps the street where you live follows an ancient track where men travelled thousands of years ago
Something of that romance may be gleaned from this article*

Roads AND STREETS The importance of roads was well realized by the ancients. The city of Babylon was paved as early as 2000 B.C., and Herodotus speaks of a magnificent Egyptian road which was built to assist in the construction of the Great Pyramid. The Incas of Peru, the Chinese, and the Carthaginians were also great road-builders.

But the masters of road construction in the ancient world were undoubtedly the Romans, whose stone-paved highways are the most solid structures in the way of roads found in any age. "All roads lead to Rome" was then literally true for that city was the centre of a network of wonderful highways, reaching from the remote east to the farthest west, and even penetrating England, where many of them still remain as monuments to the energy and skill of their long forgotten builders.

In the 11th and succeeding centuries writers mention four "Royal Roads"—Icknield Way (along the Berkshire Downs and the Chilterns), Ermine Street (London to Lincoln), Watling Street (Canterbury—London—Chester), and Fosse Way (Lincoln to Bath and Exeter). Of



ROAD MAKING, THEN AND NOW

The Romans were famed as road makers, and many Roman roads still exist in England to testify to their skill. How they were built is shown on the left. Above, you see an example of modern road-making—a highway from Leeds to Scarborough, with two traffic lanes and cycle tracks.

these, all but the first-named are Roman highways, but Icknield Street, from the Fosse Way, near Stow on the Wold, towards Aldborough, is Roman.

In the Middle Ages the magnificent Roman roads were allowed to decay, and for over a thousand years no new roads were built to take their place. The medieval traveller had to force his way through deep and miry lanes at a pace of two or three miles an hour, in constant fear of being stuck fast in some

ROADS & STREETS



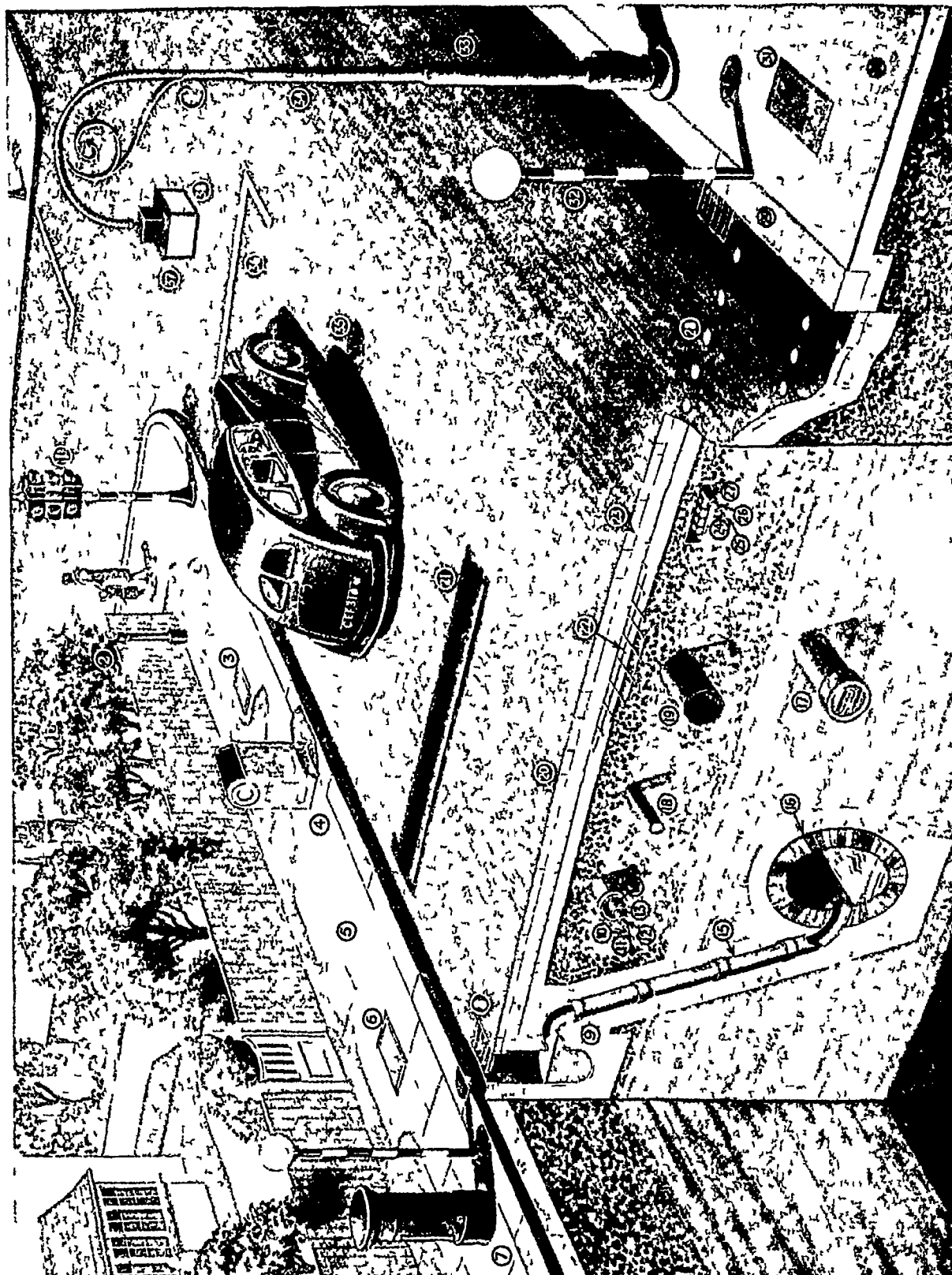
COUNTRY LANE BEFORE THE MOTOR CAR CAME

On roads like the one above you were choked with dust in dry weather, and after a heavy rain the mud was so deep that, as likely as not, your car would get stuck and you would have to pay a farmer to bring his team and pull you out. And think of the poor farm horses straining up hill and down dale with a heavy load that just had to be got to town, no matter how bad the roads were! This is the way most of our country roads looked a generation ago. But along came the motor-car, and then—



AFTER THE ROAD BUILDER HAS BEEN AT WORK

Just look at the change! It's the same old road, as you can tell by the house and the trees, but hills and valleys have been smoothed out, and a concrete pavement has been laid, over which motor cars can dash along at 40 or 50 or more miles an hour in all sorts of weather all the year round. The farmer is no longer isolated for weeks at a time. It used to take him perhaps an entire day to get to the nearest town and back. Now he does the trip there and back in a couple of hours.



TYPICAL FEATURES OF A MODERN ROAD AND WHAT LIES BENEATH ITS SURFACE

- 1 Traffic lights
- 2 Fire alarm
- 3 Manhole for electric cables
- 4 Sand-bin
- 5 Granite paving
- 6 Fire hydrant
- 7 Pillar-box
- 8 Drain cover
- 9 Concrete bedding and foundations
- 10-14 Electric cables, bound with copper wire and insulated with gutta-percha and lead
- 15 Drain-pipe
- 16 Sewer
- 17 Water main
- 18 High-pressure water main
- 19 Gas-pipe
- 20 Tarred road surface
- 21 Rubber traffic mat
- 22 actuating signals
- 23 Steel mesh to reinforce concrete
- 24 Wood blocks
- 25-27 Telephone cables, covered with wax paper, steel wire and lead
- 28 Steel road studs marking pedestrian crossing
- 29 Kerbstones
- 30 Asphalt-covered footpath
- 31 Manhole for telephone cables
- 32 Belisha Beacon, indicating pedestrian crossing
- 33 & 34 Lamp standard coated with non-corrosive paint
- 35 Man-hole for sewer
- 36 Stop-line painted on road surface
- 37 & 38 Electric lamp, specially designed to give diffused lighting

ROADS & STREETS

quagmire or overturned. Even in the time of Queen Elizabeth the only safe means of travel was on horseback or on foot.

When stage coaches were introduced (about 1659), Macaulay tells us that "it happened almost every day that coaches were stuck fast, until a team of cattle could be procured from some neighbouring farm, to tug them out of the slough." As late as 1770 Arthur Young complained of a Lancashire road that its ruts actually measured four feet deep. "The only mending it receives is tumbling in some loose stones, which serves no purpose than jolting the carriage in a most intolerable manner."

Although tolls for the upkeep of British roads were levied as early as the 13th century, many years passed before they became general. In the 17th century the practice of putting up gates, known as turnpikes, across the roads to prevent travellers from passing until the toll was paid, had become pretty well established, and under George III turnpike roads were the rule.

Pioneers of Improved Roads

Little improvement was effected in road-building until the 19th century, when John McAdam (*qv*) and Thomas Telford (*qv*) introduced scientific road-engineering in England. The former's name is commemorated in our macadamized roads. Both laid great stress on proper drainage, but whereas McAdam attached no importance to the foundation of his roads, Telford insisted on having a firm foundation.

It remained for the motor-car to give the next great impetus to the cause of good roads. In 1909 a Road Board was set up to build new roads and improve old ones, and in 1919 this was merged in the Ministry of Transport. Under the Trunk Roads Act, which became law in 1937, the upkeep of 4,500 miles of main roads is looked after by the Ministry, while other roads remain under the control of county highway authorities and local councils.

British roads are classified into A, B, and minor roads. The numbering of first- and second-class roads is done on an easily-understood national system. For instance, from A1 (the Great North Road) the branch main roads are numbered A10, A11, etc., and from A10 further roads branch off, numbered A101, A102, and so on. The great trunk roads of the country are A1, Great North Road (London-Edinburgh), A2, Dover Road, A3, Portsmouth Road, A4, Bath Road, A5, Holyhead Road, A6, London-Manchester Carlisle.

The amazing growth of motor traffic in the present century has not been accompanied by a similar growth in road mileage. Britain has the most densely filled roads of any country in the world, with 11.5 "mechanically propelled vehicles" (excluding motor cycles) per mile.

To reduce the terrible "toll of the road," which many experts blame principally on road conditions, engineers have concentrated on improving old roads and calling to their aid all sorts of modern refinements. Widening, reducing gradients, super-elevating or "banking" corners, cutting down hedges, rebuilding bridges, reducing the numbers of horses and trams on the roads, introducing intricate "roundabouts," pedestrian crossings, one-way streets, anti-skid surfaces, anti-dazzle lighting, erecting island "refuges" and road signs in profusion, painting white or coloured lines at danger points—these are only a few of the measures adopted. (See also Motor-car and Motoring, Road Safety)

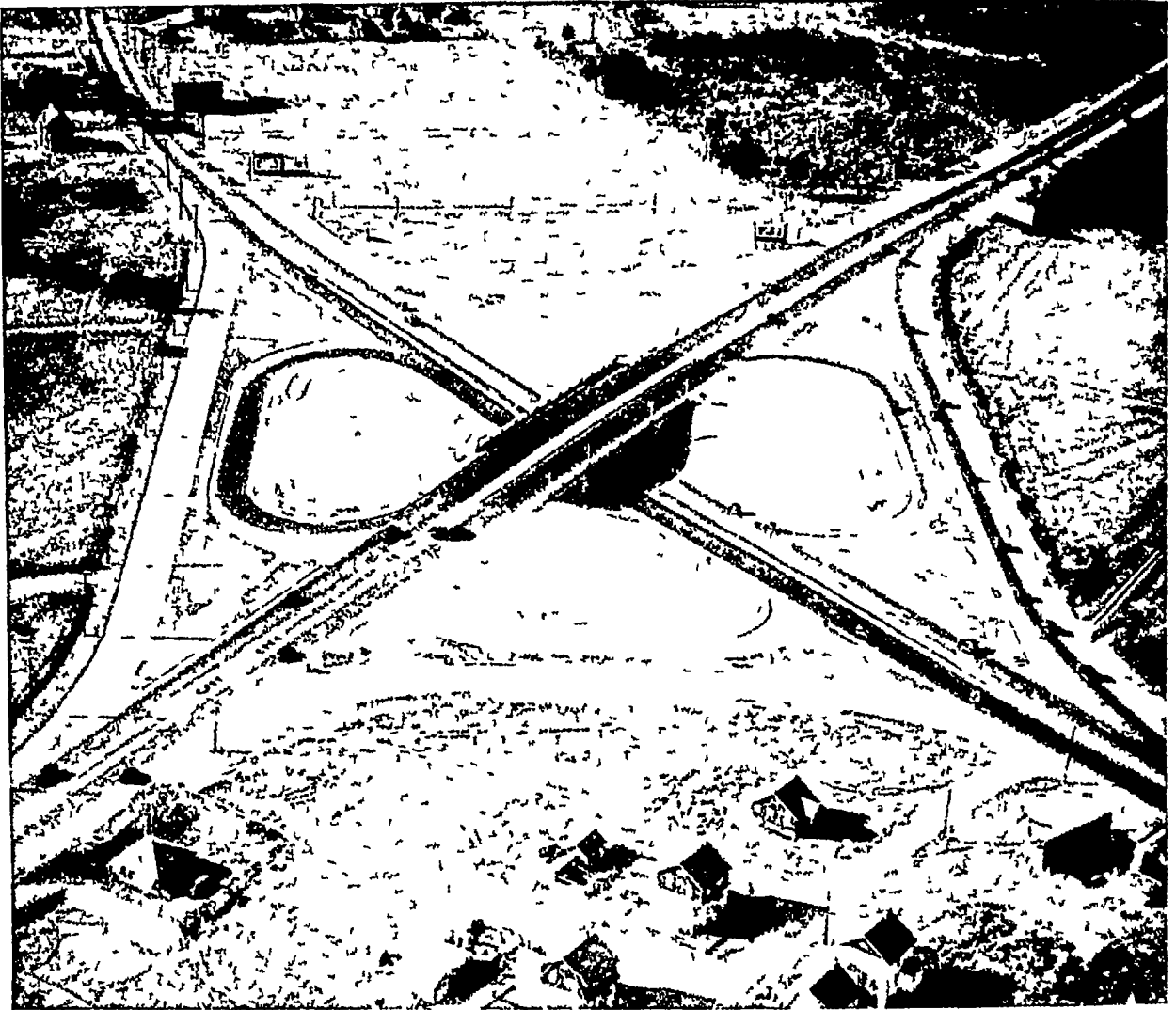


ROAD RAMMER IN ACTION

This is one of the latest devices for speeding up road work. It weighs half a ton, yet, as you can see, one man can work it with ease. Driven by internal combustion, it makes from 30 to 40 blows a minute, jumping over a foot from the ground and gradually advancing.

Gradually, however, it is being realized that even all this activity is not enough, and that the construction of entirely new roads is the only real solution. There have been many cases of new arterial or "by-pass" roads being built and hailed at the time of their opening as the very last word in road construction. In a few years, however, the traffic has grown on these highways to such proportions that danger is actually increased and speed no higher than that on the old road. Moreover, unsightly garages, factories, cheap houses, and poster advertisements line the roads, until the latter's original ugliness is made worse. Unrestricted "ribbon development" in built-up areas, however, has been checked by recent legislation.

Germany, with her magnificent system of *Autobahnen*, and Italy with her *Autostrade*, undoubtedly lead the world in really modern through roads. To begin with, only fast



' CLOVER-LEAF ' ROAD JUNCTION

America pays increasing attention to the amenities of highway travel, and the "clover-leaf" system of road junctions, as shown above, has been widely adopted to render more safe the flow of traffic. Traffic lines separate for turns, and direct traffic passes across or under the central bridge. The turnings bear to the right to conform to the American "rule of the road."

motor traffic is allowed on these roads, which have dual carriage-ways with a strip of vegetation between. They by-pass all important towns, the roads to towns situated on the left turn right off the main highway and then left over or under it. (It should be remembered that the "rule of the road" on most of the Continent is "keep to the right.") "Flyover" junctions, avoiding any cross-traffic, are another feature of these high-speed motor-ways, an extension of this idea is the "clover-leaf," a more elaborate form of junction. Special tracks for the use of cyclists, now being introduced in England, are a common feature of Continental road systems.

What Roads Are Made Of

There are now many different materials used in road construction. The most important are described below.

Macadam (named after the inventor) is the name given to roads surfaced with fragments of hard stone (small enough to pass through a screen with meshes $2\frac{1}{4}$ inches square diameter) arranged in a bed of from 6 to 12 inches in thickness, compacted by means of steam-rollers, and covered with smaller pieces and gravel. For over 100

years after McAdam put down the first piece of this road in London, in 1817, this method was much used.

Bituminous macadam is a type of broken stone road which was introduced when the advent of the motor-car had made it desirable to have a stronger binder. Coal tar or asphalt is added to the top layers of crushed stone to make the surface dust and water-proof.

Asphalt is one of the most satisfactory of paving materials, and since its introduction in London in 1809 its use has increased rapidly. The asphalt is laid hot on a foundation usually of concrete, and hardens into a smooth, elastic, and durable substance for streets and paths. Coloured asphalt (purple, etc.) has recently been introduced.

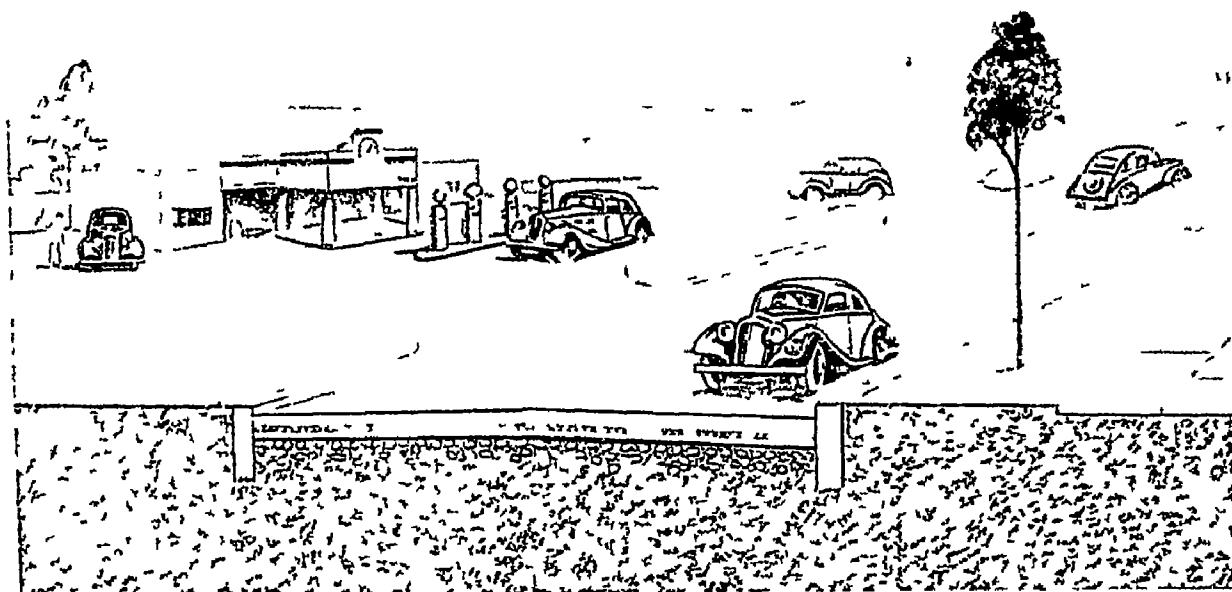
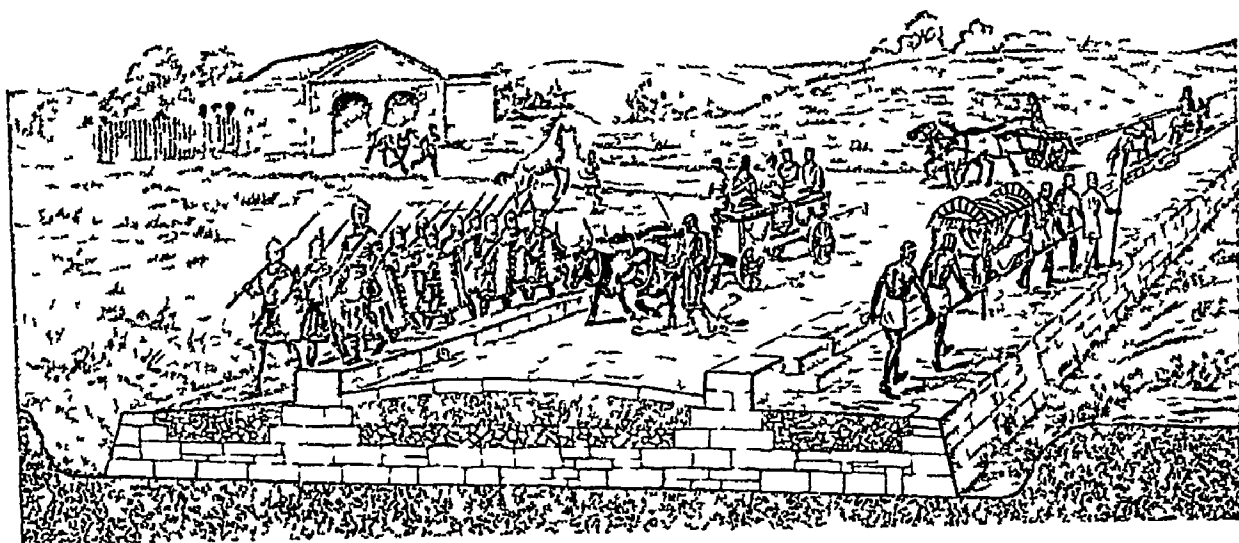
Cobblestone paving was once used extensively, but now its place, especially for heavy traffic, is usually taken by *granite setts*.

Wood block pavements were introduced into England in 1830. The blocks, which are treated with creosote, are laid on a concrete foundation. The joints are filled with hot pitch, and then the surface is tarred and gravelled.

Concrete seems to have been used as a paving surface in Scotland about 1865, and since 1900 concrete roads have become common.

Iron and steel setts laid on concrete, make a strong surface, though bad for tires and unpleasant for cyclists.

Rubber is a new material so far as roads are concerned, introduced in an effort to reduce noise.



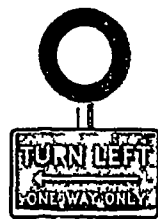
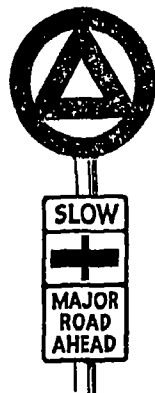
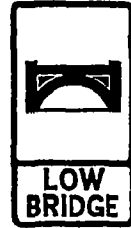
HOW A ROMAN ROAD COMPARES WITH A MODERN HIGHWAY

GOOD roads have been common only twice in history—in the days of Roman power and today. The Romans excavated down to the sub soil, over which a layer of fine earth, rammed hard, formed the "pavimentum." Over this were placed squared stones, covered with rubble mixed with lime. Then a "nucleus" was added of chalk, broken tiles, and gravel mixed with lime and well rammed and upon this the actual road surface was laid, usually of stone setts. Today we build much simpler beds, thanks to our knowledge of concrete. In the above drawings of Roman and modern roads, note how some of the features of the roads of nearly two thousand years ago are reproduced in those of twentieth century Britain.

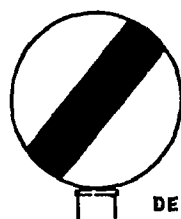


ROAD SIGNS

A red triangle surmounting a sign indicates a warning, a red disk or red circle indicates a prohibition or restriction. A combination of circle and triangle is used to surmount the 'Slow Major Road Ahead' sign and the 'Halt at Major Road Ahead' sign.



TEMPORARY CONTROL SIGNS FOR USE WHERE ROAD WORKS, ETC., ARE IN PROGRESS



A portable sign for use during the daytime by a person duly authorized for the purpose by the highway authority



SIGNS THAT MAKE FOR SAFETY ON BRITAIN'S ROADS

The growth of vehicular traffic has necessitated a number of road signs, which, to be of practical use, must be clear and self-explanatory. The poster reproduced above is issued by the Safety First Association and contains the principal signs drawn up by the Ministry of Transport. They are divided into four classes—warning, informative, prohibitive, and mandatory (commanding).

RULES of the ROAD for the SAFETY of ALL

The appalling death-rate resulting from road accidents has engaged the attention of the Government, but pedestrian crossings, Belisha beacons, lights, and so on are not enough We must all use common sense and care

Road Safety. It is a terrible reflection on our modern civilization that children in school should have to be taught how to protect themselves, not only against possible enemy air raids in the future, but also against an ever-present and everyday danger—that of death or injury on the roads



The increasing use of motor-cars has brought about this problem of accident prevention. In 1937, 6,591 persons were killed and 226,339 injured on the roads of Britain. Many devices

have been invented to meet this problem. Dangerous and sharp bends, blind streets, railway level crossings, etc., are usually marked plainly, often with signs that glow at night. Organizations like the Automobile Association

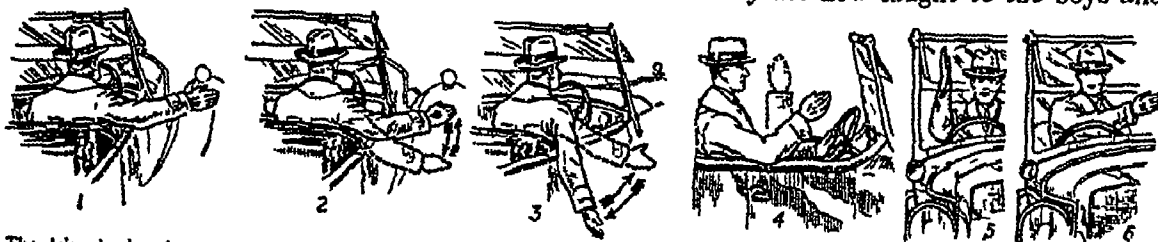
(A A) and the Royal Automobile Club (R A C) assist the authorities in placing signs at points of danger, and a great deal has been done to improve the roads themselves. (See also Motor-car and Motoring, Roads and Streets)

Great efforts have been made in the last few years to try to educate all classes of road users—the pedestrian as well as the motorist and cyclist, and the child as well as the adult. It is old people and the very young among pedestrians who are most liable to come to grief.

The National "Safety First" Association has compiled a list of sensible safety rules for children. Here are five of them.

- (1) Always walk on the footpath if you can, and cross the road at a refuge, crossing, or subway if there is one.
- (2) Always look both ways before you cross a road, or before you pass in front of or behind a vehicle. *Never run across without looking.*
- (3) Never steal rides on vehicles.
- (4) Never play dangerous games in the streets, and never throw anything at a moving vehicle.
- (5) Never chase anyone or anything into the roadway.

In some of the schools where these principles of road safety are now taught to the boys and



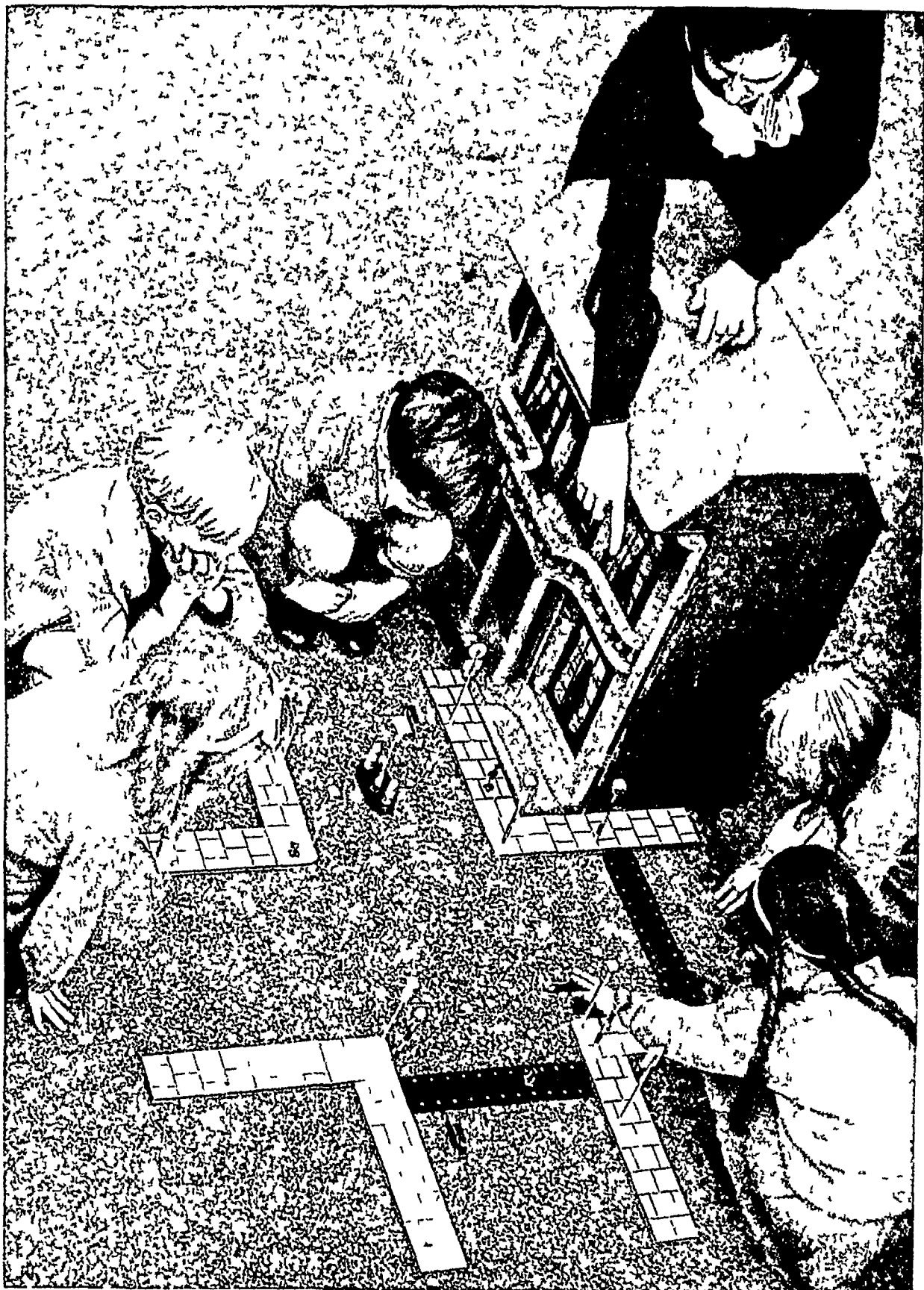
The driver's signals are (1) "I am about to turn right", (2) "Slow down!" and (3) "Pass me." The signals shown in 4, 5 and 6 are for the information of traffic policemen. The sign shown in 4 and 5 indicates the desire to go straight on. 6 means "I want to turn left."



RECOGNIZED SIGNALS THAT MAKE FOR ROAD SAFETY

Here we see the traffic policeman's signals that all road users must obey. In 7 he is bringing on a vehicle from his front and in the two positions in 8 he is releasing traffic from the left and right respectively. In 9 the officer is halting a vehicle approaching him, while in 10 his left arm is outstretched to halt traffic coming from behind. Vehicles approaching simultaneously from in front and from behind are halted as shown in 11.

TOYS THAT TEACH THE RULES OF THE ROAD



Keystone

In an attempt to lessen the number of road accidents, children everywhere are being made "traffic conscious" in their play. These kiddies get a lot of fun as well as instruction out of their Lilliputian road system. See how absorbed they are as the teacher describes the uses of Belisha crossings, traffic lights, island refuges and road signs. Traffic regulations and the major points of the Highway Code are explained to them in simple yet interesting fashion.

girls almost as a 'subject,' like arithmetic or English, the police co operate with teachers

The police, we must remember, are there to help, and will usually escort children across a busy street to and from school. Pedestrian crossings, marked by the orange 'Belisha beacons' introduced by Mr Leslie Hore-Belisha when Minister of Transport, are the correct places at which to cross. In fact, a pedestrian on one of these crossings normally has the right of way and may stop traffic until he is safely across. (This privilege should not, however, be abused, and no one should ever loiter in the road). Sometimes the use of these crossings is controlled by traffic lights or by a policeman on point duty. In some cases, too, a light changes to green or a notice "cross now" is illuminated for the pedestrians' benefit. Even then, a sharp look-out should be kept, especially for traffic turning left or right at crossroads.

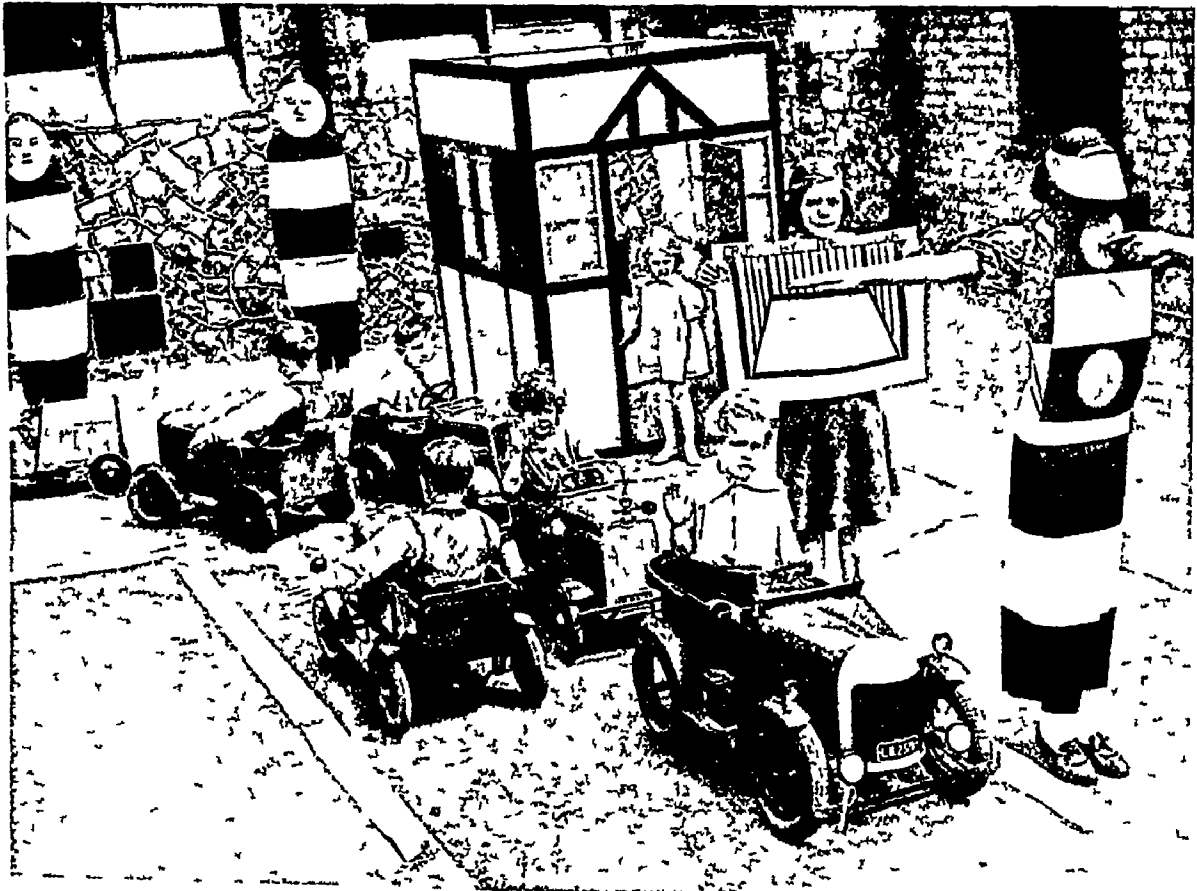
The motorist, who realizes the helplessness of the pedestrian or cyclist should he or she be involved in an accident, has plenty of duties and responsibilities of his own, and must always be on the alert. Mere speed is rarely the cause of a smash, more often it is the result of taking a

risk, carelessness, an error of judgement, or sheer bad luck.

The "Motorist's Bible" of correct behaviour and procedure is the Highway Code—a copy of which is given to every new driver, and which anyone may obtain at a Post Office for a penny. All road users should read, and re-read, this little booklet, which shows how safety on the road can be obtained by the exercise of two faculties—common sense and carefulness.

Roberts OF KANDAHAR, EARL (1832–1914) In 1852 Frederick Sleigh Roberts, then a diminutive youth of 20, in the brand-new uniform of a Lieutenant of Artillery, and with the erect carriage acquired in the Royal Military College at Sandhurst, embarked from England for India. He was immediately nicknamed "Bobs" by the officers of his mess.

He was keen, cool, a shrewd observer, and very popular, and his soldiers grew ashamed not to follow where he led. Having been born in India, where his father was a General, it was easy for him to learn Hindustani so as to deal personally with native soldiers. He trained himself to remain in the saddle for 36 hours at a stretch. He had the topographical instinct



TRAINING THE VERY YOUNG IN 'ROAD SENSE'

Keystone

London schools have taken an admirable lead in the traffic education of children. Here are kiddies at the Hutton L.C.C. residential school, where a complete miniature road system has been laid out, and the children have even been provided with miniature cars. Teacher, in this instance, is disguised as a "traffic light," and two older pupils in the background as 'Belisha beacons'. Children trained in this way grow up with a "road sense" which will prove very valuable, and may do much to reduce the number of traffic accidents.

that is invaluable to a soldier. Moreover, he kept himself in good health even in the most unhealthy parts of India, and he was a very courageous soldier.

He distinguished himself in the Indian Mutiny of 1857, in the Abyssinian expedition of 1867, and in the Afghan War of 1878-80, rising steadily in rank. His most brilliant exploit was performed as Major-General in command of the column that marched from Kabul to the relief of Kandahar, covering the distance of 313 miles through a hostile country in 22 days, and gaining a complete victory. He served in India off and on for 41 years, and when he finally left that country in 1893 he was Commander-in-Chief of the Army in India.

Lord Roberts, as he was now, was in his 68th year when disasters to the British Army in the Boer War that began in 1899 demanded his presence in that field. A sign of relief went up from England when he was appointed Commander-in-Chief in South Africa. He quickly brought order out of chaos, posted every man to the best advantage, and led the main column of the army of invasion. He struck at General Cronje entrenched at Kimberley, captured Bloemfontein, capital of the Orange Free State, compelled the Boers to abandon the siege of Ladysmith, divided and demoralized the forces of the enemy, ignored the guerilla chief—General De Wet—and bluffed his way on scanty rations into Pretoria, and so turned defeat into victory.

Having handed over the command in South Africa to Lord Kitchener, Lord Roberts returned to England to succeed Lord Wolseley as Commander-in-Chief of the British Army, and in January 1901 he was created an Earl. The remainder of his life was devoted to urging the principle of universal military service, which was actually adopted during the World War. Robert died of pneumonia in November, 1914, while on a tour of inspection of the Indian regiments in France. His life may be traced in his autobiography, "Forty-one Years in India."

Robespierre, MAXIMILIEN (Pron robz'-pyär) (1758-1794). As a student in Paris and afterwards as a lawyer in his native city of Arras, Robespierre—famous (or infamous)

as one of the great leaders of the French Revolution—was noted for his ability and conscientious perseverance. His natural timidity was shown by his action in resigning a judgeship rather than pronounce sentence of death. His writings gained him a seat in the States-General of 1789, where he won fame by his popular views and earnestness of manner.

It was, however, in the Jacobin Club (*see* Jacobins) that Robespierre found his first great opportunity. He became the acknowledged chief of that powerful body, and also a leader of the people of Paris. His reputation for honesty contributed to his power. In the

"Convention," the third of the French Revolutionary assemblies, Robespierre was the recognized leader of the radical party, called from their high seats "the Mountain." He took a leading part in bringing the king to trial, declaring that Louis XVI "must die that the country may live."

Robespierre was also the best-known member of the Committee of Public Safety (1793-94), which saved France from conquest by foreign enemies and from revolts at home in the trying time of the Terror. But he was not a man of action, rarely attended the sessions, and had almost no part in its routine work. Yet the credit for France's titanic efforts, as well as the blame for the guillotinnings of that time, he longs largely to him.

In private life Robespierre was very austere. Like many young Frenchmen, he had read the works of Rousseau (*qv*) and had absorbed them. As a deist (a believer in God, though not in the Christian revelation) he sent the atheist Hébert to the guillotine. Danton (*qv*), to whose superb energy and audacity the triumphs of the Revolution were largely due, was guillotined because he believed that the Terror had accomplished its work and that the time for moderation was at hand. Then, to check atheism, Robespierre introduced the worship of "the Supreme Being," based on the ideas of Rousseau.

Most of Robespierre's associates on the Committee of Public Safety, however, had little sympathy with his ideas. It was said of him that he had "made Virtue odious by continually prating about it." Many feared lest



MAXIMILIEN ROBESPIERRE

Robespierre's influence on the later stages of the French Revolution was as immense as it was evil. His greatest crime was that he perpetuated the Terror when the last vestige of excuse for it had vanished, and he left a legacy of hatred, bloodshed, and chaos.

Painting by Largillière. Carnavalet Paris photo Bulloz

YOUNG ROBERTS CHEATS DEATH AT DELHI



At the siege of Delhi, which occurred in September, 1857, at the beginning of the Indian Mutiny, the defending force sent out an appeal for artillery officers and Roberts, who was then a lieutenant, was one of those who answered the call. He was in charge of the guns a little to the right of the Kashmir Gate when, with wonderful accuracy, the enemy sent a round shot through one of the gun embrasures, and knocked over Roberts and the men who were serving it. Luckily, Roberts was only stunned, but his comrade who had been serving the gun, had one of his arms torn off.



THE ROBIN AND ITS HOME

Is any bird more popular than the robin redbreast, with its perky bearing, large, bright brown eye, and handsome plumage? Here is one posing for the photographer, while below is a robin's nest, with six eggs, on a shelf in an old shed

Photos top M H Crawford below A S Martin

they might be sacrificed, as Danton had been, to Robespierre's love of power and narrow self-righteousness. On July 27, 1794, his enemies forestalled an attempt against themselves by obtaining the arrest of Robespierre, Saint-Just, and other of his intimates. Robespierre was shot in the jaw in an attempted rescue (see illustration, page 1760), and next day he and his adherents were guillotined by order of the Convention.

Danton's words, "Robespierre will follow me, he is dragged down by me," were thus proved true. With the fall of Robespierre the Terror soon came to an end. (See also article on the French Revolution)

Robin. "Cheer up!" cries the robin redbreast—and then he practises what he preaches. On a frosty winter morning, when worms stay safely out of reach of his hungry beak, he never mopes, but pipes up with his silvery note, and indeed he is the only bird who sings regularly throughout all the autumn and winter months. The robin's friendly trustfulness has won for him the love of everyone. When you dig in

your garden you may frequently see a robin quite close to you, and often he will perch on your fork. But if another of his kind comes into his territory, you will see as fierce a fight as any in birdland, and one robin may be dead when it is over, his skull pierced by his rival's sharp bill. Each robin, in fact, keeps to his own territory as much as he can.

This little brown optimist, with his bright red breast, is too well known to need much description, though you may not at first realize how handsome he really is, his breast set off by a blue-grey edging, with white on his under-parts. His mate has similar plumage, with a paler breast, his children, like all young thrushes, to which family the robin belongs, have speckled breasts. The robin nests in a hole in some grassy bank, laying four or five reddish-speckled eggs.

In the autumn some robins migrate, but others stay at home for the winter. When the frost comes, these stay-at-homes grow more friendly than ever, and will venture quite close to houses.



The robin, whose scientific name is *Erithacus rubecola*, is found in Europe, Western Asia, and Northern Africa, and is especially common in Great Britain.

Robin Hood. In the days when Plantagenet kings ruled in England, the bold outlaw Robin Hood and his merry men roamed the green glades of Sherwood Forest, near Nottingham town, in the centre of England. There they lived a gay life, as the old ballads tell us.

No archer ever lived that could speed a grey goose shaft from the longbow with greater skill than Robin Hood. And his heart was as true as his aim was sure. All the people round about

ROBIN HOOD

loved him, for he despoiled the portly abbots and monks and lords who oppressed them, and he shared his spoils with the poor and needy. He was fair in war and courteous even to his foes. He shed no blood if he could help it, and never let harm befall women and children.

And how came good Robin to be an outlaw? You must know that in those days the forest laws were very strict, and because Robin Hood had once killed one of the king's deer, and had also, as some of the old stories tell us, slain one of the king's foresters who threatened his life, a price was set upon his head and he was forced to flee into the depths of the greenwood. Soon other bold men who were outlawed like himself, or who hated the hard rule of the barons, or who loved the free life of outdoors better than the settled life of industry, joined themselves to him. And so grew that merry band, which included Little John, Will Scarlet, Friar Tuck, Maid Marian, and other familiar characters of the story.

Was Robin Hood a real person? Many scholars believe there is some historical basis for the legends, and they grew up about some actual victim of the ruthless forest laws of the Norman kings.

What we do know is that the character of Robin Hood represents the ideal of the common people in the later Middle Ages, as King Arthur represents the ideal of the upper classes. He stands for liberty and the rights of the people.

The most ancient ballads of Robin Hood have been lost, but some of those that have been preserved date as far back as the 14th century. In addition to these, the chief source of the legends, as we know them today, is the "Little Geste of Robin Hood" (*gest* meaning a tale of deeds), printed about 1510, which was evidently compiled from a number of older ballads. Among the books which introduce Robin Hood is Scott's "Ivanhoe."

Two Adventures of Robin Hood and His Merry Men



How Little John Got His Name

"NO sport have we seen for fourteen days," said Robin Hood one bright spring morn, "so now I will go abroad to seek adventures forthwith. But tarry ye, my merry men all, here in the greenwood, only see that ye mind well my call. Three blasts upon the bugle horn I will blow in my hour of need, then come quickly, for I shall want your aid."

So saying, he set off and strode along until he came to a narrow bridge that spanned a little stream. At one end of it there stood a man, a good seven feet tall, who carried a staff that looked like a small tree trunk.

"Now stand thou back," quoth Robin, "and let the better man cross first." "Nay," answered the stranger, "then stand back thine own self, for the better man am I."

"That we shall presently see," said Robin Hood, "for if thou movest one step forward, I will send a good Nottingham shaft betwixt thy ribs."

"Thou pratest like a coward," said the stranger, "to talk of shooting with thy bow, when I have only this plain staff to defend myself."

"Faith, never have I had a coward's name in all my life before," replied Robin, and so saying he went to the wood and cut himself a stout oak staff, six feet in length. Then taking their staffs by the middle with the two hands wide apart, Robin and the stranger stepped upon the narrow bridge and gave blow for blow in one of the stoutest quarterstaff bouts that ever man saw. Robin smote the stranger upon the ribs until his jacket smoked like a damp straw thatch in the sun, and the stranger gave Robin a crack on the

crown that caused the blood to flow, and still both kept their footing. But at last the stranger gave Robin such a blow that he fell head over heels into the water as a pin falls in a game of skittles.

"And where art thou now, good lad?" cried the stranger, roaring with laughter. Robin laughed too as soon as he could get his breath, and scrambling to the bank he said "I needs must own thou art a brave soul as well as a stout fellow with the quarter-staff, and hast fairly won the fight."

"A Fair Fight Fairly Won!" said Robin Hood. Then he set his horn to lip and blew a loud blast. Scarcely had the echo died away when his men appeared, a score or two of stout bowmen, all clad in Lincoln green.

"Good master, how is this?" cried Will Stutely, seeing Robin Hood dripping from head to foot.

"Yon fellow hath tumbled me in the brook," replied Robin.

"Then in he shall go, too." And the lads made for the stranger, and would have given him a good ducking and also a drubbing, had not Robin cried out, "Nay, forbear! He hath beaten me in fair fight, and if he will stay with us and be one of our men he is right welcome."

"What name goest thou by?" he asked as the stranger gave him his hand.

"John Little," answered the stranger solemnly, at which all the men laughed heartily, and Will Stutely cried out.

"Little art thou indeed, and small of bone and sinew, and therefore shalt thou be christened Little John!"

"But at last the stranger gave Robin such a blow that he fell head over heels into the water."



"Then come, my merry men," quoth Robin Hood, "and we will prepare a christening feast for this fair infant."

So through the forest they went until they came to a great oak tree with broad-spreading branches and neath it a seat of green moss where Robin was wont to sit at feast and merry-making with his good men about him. A brace of fat does from the king's fine herd was brought forth and a barrel of humming ale was broached.

Then whilst great fires crackled and the savory smell of sweetly roasting venison filled the glade, some of the men stood forth and contended with the quarterstaff, whilst others set up garlands on the branches of trees and shot at them in archery practice. When the feast was ready, all sat down, and Robin Hood placed Little John at his right hand.

And thus, amid jest and song and good cheer, they christened Little John, who was to win renown second only to that of Robin Hood himself.

The Shooting-Match at Nottingham

NOW you must know that all this time the proud Sheriff of Nottingham was trying in vain to bring Robin Hood to justice. So many times had he tried and failed that the king had spoken harsh and scornful words. Then at last he bethought himself how he might use guile to capture the daring outlaw.



"John Little", answered the stranger solemnly, at which all the men laughed heartily."

STRAIGHT FLEW THE ARROW TO THE VERY CENTRE'



"It is of no avail," thought the Sheriff, "to seek out that evil knave Robin Hood in his woodland haunts. But if I could only persuade him to come nigh to Nottingham Town, I warrant I would lay hands upon him so stoutly that he would never get away again."

So he bethought him to proclaim a great shooting-match to which everyone who could draw a longbow should be bidden. An arrow of gold was to be the prize and he who won it fairly and squarely should be hailed by all as the greatest archer throughout the length and breadth of the land.

"If I know aught of Robin Hood," quoth the Sheriff, who was Robin's greatest enemy, "he will never submit to see that title won without making trial to win it himself."

When Robin Hood heard of the Sheriff's proclamation he called his men about him and said: "I fain would have one of us win this fair prize that our sweet friend the Sheriff offers, and therefore will we take our bows and shafts and go to Nottingham Town. What say ye, lads?"

"Have a care, good master," said one of his followers. "I have heard it said that this same shooting-match is but a trap whereby the knavish Sheriff would draw thee into the town and so beguile thee."

"Then," said Robin, "must we meet guile with guile. We shall lay aside our suits of Lincoln green and go in disguise—some as shaven friars, some as rustic peasants, and some as tinkers or as beggars. How like you the plan, my merry men all?"

"Good, good!" cried all the band right heartily.

The great day was arrived, and at the appointed time the Sheriff took his place in the seat of honour near the target. Leaning forward he scanned the crowd of archers that had come from far and near throughout merry England, but he saw none clad in Lincoln green, such as was worn by Robin Hood and his men.

And now the archers began to shoot, each in turn, and never had the good folk seen such archery as was shown that day. The ten best men were chosen to shoot again.

"Seest thou Robin Hood amongst those ten?" asked the Sheriff of a man-at-arms who stood near him.

"Nay, that I do not, your worship," answered the man. "Six of them I know right well and of the

others none is of Robin Hood's size except perhaps that tattered beggar in scarlet, and he has a beard of brown instead of yellow, besides being blind in one eye."

Each of the ten now shot again, and then from these the three best were chosen for the final contest. One of these was the tattered stranger in scarlet with the patch over one eye, another was Gilbert o' the Red Cap, one of the Sheriff's own archers. Twice they shot, all three, and it was soon seen that the match lay between Gilbert and the tattered stranger. On the third shot Gilbert's shaft lodged close beside the spot that marked the very centre.

"Well done, Gilbert!" cried the Sheriff joyously. "Now, thou ragged knave, let us see if thou canst shoot a better shaft than that."

All held their breath as the ragged stranger stepped forth. Hitherto he had shot so quickly that one could scarce take breath between the drawing and the shooting, and men marvelled that one blind of one eye could shoot so well. Now he shot with greater care, holding his trusty yew drawn for a moment before loosing the string. Straight flew the arrow and so true that it smote a feather from off Gilbert's shaft and lodged in the very centre.

"Here, good fellow," quoth the Sheriff as he

stepped down in silks and velvets to where the tattered archer stood. "Take thou the prize, for well and fairly hast thou won it. I trow thou drawest better bow than that same coward knave Robin Hood, that dared not show his face here this day."

The Feast of Victory

That afternoon, in the depths of Sherwood Forest, Robin Hood's men feasted merrily, but the soul of their leader was vexed. He it was who had won the prize from the Sheriff's own hands, and the Sheriff's words rankled in his heart. "I would fain let him know who it was that won the golden arrow from out his hand," at last said Robin.

Then up spoke Little John. "Let me but go to Nottingham Town, and I will send yon Sheriff news of this by a messenger such as he does not expect."

That night as the Sheriff sat at meat in his great hall talking of the shooting-match and wondering who might be the bold archer who had won the prize, a blunted gray goose shaft with a small scroll attached came through the window and fell upon the table.



An arrow came through the window with a scroll attached. The Sheriff grew red with rage as he read the scroll and learned that he had given the prize to Robin Hood.

The Sheriff opened the scroll and grew red with rage, for on it he read

Now Heaven bless thy grace this day,
Say all in sweet Sherwood,
For thou didst give the prize away
To merry Robin Hood

—Retold from Howard Pyle's "Merry Adventures of Robin Hood"

Rob Roy. The real name of this celebrated Scottish outlaw of the late 17th and early 18th centuries was Robert MacGregor (1671-1734). His name "Roy" came from his ruddy complexion and red hair, for it is the Gaelic word for "red." At times he was known by his mother's name of Campbell, owing to the fact that the clan MacGregor had been outlawed by the Scottish Parliament. He was famous as a broad swordsman, in which manner of fighting his long arms gave him an advantage. In 1693, although not the nearest heir, he was chosen head of the MacGregor clan.

Like many of the Highland landed proprietors of that time, Rob Roy engaged in the business of grazing and selling Scottish black cattle for the English market, and to protect his herds he kept about him a band of armed followers. His greatest trouble began in 1712, when the Duke of Montrose, from whom he had borrowed money for his cattle business, seized his lands on account of this debt and had him proclaimed an outlaw. Rendered desperate by misfortune, Rob Roy collected a band of his armed clansmen and made war on the duke, robbing him of his cattle and preventing him from receiving the rents of his tenants. Many stories are current in the neighbourhood of Loch Lomond and Loch Katrine of Rob's narrow escapes from capture by the troops that were sent to take him. Many instances also are recorded of his kindness and liberality to the poor at the expense of the rich.

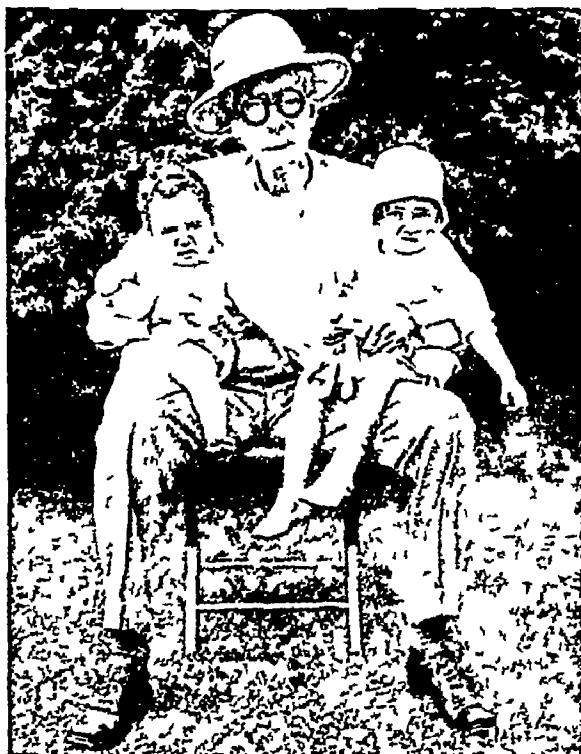
In 1722 he gave himself up to the English authorities. After being imprisoned for a time he was sentenced to be transported to the New World, but was pardoned and permitted

to return to his highland home, where he died December 28, 1734. Rob Roy's exploits have been immortalized in Sir Walter Scott's novel which bears his name.

Rochester. On the river Medway, between Strood and Chatham, stands the old Kentish cathedral city of Rochester. The cathedral was built during the 11th and 12th centuries, but has been altered and added to frequently. The massive keep of a Norman castle is still standing, and the priory and guildhall are remarkably fine buildings.

Famed for centuries as a port, it has now become a great centre for the building of flying boats and seaplanes. Other industries include the manufacture of agricultural implements, steel, cement, and oil-cake. Above Strood is Gad's Hill Place, famous as the residence of Charles Dickens. The population of Rochester is 31,200.

Rock Asphalt. Sandstones and lime-stones impregnated with asphalt are known as rock asphalt or bituminous rock. Deposits of rock asphalt have been found in Switzerland, France, Belgium, Italy, Sicily, Alsace, and the United States. (See Asphalt.) When crushed, mixed and heated it can be applied to road surfaces as a paving material in the same way as asphalt.



ROCKEFELLER—SUPER MILLIONAIRE

John D. Rockefeller, seen above with his two great-grandchildren, was the most prominent figure in American "big business" until his retirement in 1911. At one time he was probably the wealthiest man in the world, and he devoted enormous sums to philanthropic objects.

Rockefeller, JOHN DAVISON (1839-1937) This great capitalist, for long the richest man in the world, was born at Richford, New York, whence his parents moved to Cleveland when John was 12 years old. At 18 he was a partner in a produce commission firm, but his real life-career began in 1862, when he and his brother William entered the oil business.

In 1870 the various interests of the brothers were incorporated as the Standard Oil Company of Ohio, with John as president. In the 1870's the railways were competing desperately for business by giving rebates and drawbacks. The Standard Oil Company not only secured from the railways a rebate from the published rates on all the oil shipped by itself, but also

forced them to pay an agreed sum for every barrel of oil which the railway carried for its competitors

Armed with this double-edged sword, Rockefeller's company, the Standard Oil Company, quickly put its rivals out of business, by forcing them to sell out on terms laid down by Rockefeller. Owners of oil wells were also equally dependent on the one great oil-refining company, and so an enormous business, controlling 95 per cent of the oil refining and yielding great profits, was built up in ten years. Rockefeller, replying to a storm of criticism, declared under oath that he was not the originator of the practices by which the company built up its monopoly, but it was not until his later years that his personal unpopularity lessened.

In 1911 he retired from business in favour of his son, John D. Rockefeller, Jr. The latter has likewise gained world-wide fame as an industrialist and philanthropist.

Rockefeller Senior founded, amongst other organizations, the University of Chicago, the Rockefeller Institute for Medical Research, and the Rockefeller Foundation "to promote the well-being of mankind throughout the world." His benefactions probably totalled over £150,000,000. On his death in 1937, at the great age of 97, Rockefeller's own fortune was found to be a comparatively small sum.

Rocky Mountains. This long multiple chain of rocky, snow-capped mountains, which runs through North America from the border of Mexico to Alaska, is sometimes spoken of as the backbone or the roof of that continent. In Colorado alone the mountain area is three times that of the Alps, and it includes more than 300 peaks that rise far above the timber line. There are no less than six national parks in the Rockies, not counting other reservations.

The scenery of the Rockies varies from the strange formations of the Yellowstone region, in north-western Wyoming, to the Alpine landscapes of Glacier National Park in Montana and the flat-topped mesas of New Mexico. In the northern Rockies are numerous small glaciers. In Colorado, which is the typical Rocky Mountain state, the mountains occur in several parallel north-and-south ranges, with broad grassy parks or valleys in between. These smooth valley floors, lying at heights of from 6,000 to 7,000 feet, slope gently to the base of the mountains.

In climbing one of the Rockies—Pike's Peak, for instance, which rises 14,110 feet from the plain—you find the greater part of your way lying through forests. At 11,000 feet or 12,000 feet the trees finally give way to sturdy healthy growths, but not without a struggle. On the frontier line the trees stand only eight or twelve feet high, deformed by the buffeting of the wind, their straggling branches all pointing to leeward.

Sometimes they crawl along the ground instead of standing upright.

But the summits are not so bare as they look from a distance, above the dark cloak of forest. In the United States especially there are no perpetual glacier caps, as there are in Switzerland, and wherever soil can cling to the gentler slopes you will find Alpine pastures, rolling moorlands, and wet meadows like the Arctic tundra. Sometimes there are acres of low tangled growth, sometimes carpets of gay flowers. Time and again you come upon an exquisite little blue lake lying in a cup hollowed out by some glacier millions of years ago.

Animals that Dwell in the Rockies

Among the sheer walls and shattered summits breaking off into canyons at heights of 12,000 feet and more, you may catch sight of the mountain sheep. Following their leader, they make long flying leaps from one slender shelf of rock to another, rarely coming to the lower levels. Other animals of the Rockies are the mountain lion, the sheep's greatest enemy, and the black and grizzly bears.

Up to 1803 no white man had ever looked upon the northern ranges of the Rockies, and before 1840 the smoke of the trapper's camp fire and a few scattered trading-posts were almost the only traces of the white man. Next came the miners, about 1858 for almost all the ranges are rich in some sort of ore. Today, however, the typical industry of the Rocky states is farming.

Geologically the Rocky Mountains are much younger than the worn-down and re-elevated Appalachians. They were formed by numerous long-continued movements of geologically recent date, consisting of repeated irregular uplifts. The highest peak in the Rockies is Blanca Peak (14,463 ft) in Colorado. There is also Mount Massive in Colorado (14,404 ft), and many other summits are over 13,000 ft high.

In Canada the term Rocky Mountains may be considered as covering the whole of the western highlands. There the mountains have a more rugged and Alpine character than in the United States, with numerous glaciers. The chief peaks are Mount Logan (19,850 ft), near the Alaska frontier, and Mount Robson (12,972 ft), farther south. (See illustration in page 799)

Rodents. By far the largest of all the orders of mammals is that of the rodents or gnawing animals. It contains about 2,000 species, distributed over nearly all parts of the world, and embracing such familiar animals as squirrels, hares and rabbits, rats and mice, porcupines, and beavers.

All rodents have broad chisel-like incisor teeth adapted for gnawing. There are no canine teeth and so a gap occurs between the incisors and the molars, or grinding teeth. The incisors keep constantly growing from the roots as

MEMBERS OF THE WIDESPREAD RODENT RACE



The rodents are one of the most successful of all animal groups, largely because they have been able to adapt themselves to a wide range of forms and habitats. In these three types you see only a small portion of their range. Above is a porcupine, one of the largest of the group, amply protected by his thick armament of sharp quills. The small central portrait is of a chipmunk or 'ground squirrel' distinguished by his huge cheek-pouches. At the bottom is a woodchuck, one of the marmots.

fast as they are worn away from the top, and the lower jaw is so hinged as to allow not only an up-and-down movement but also backward-and-forward and sideways motions

Most rodents are small, the largest, the capybara of South America, being only the size of a half-grown pig, but they work mischief far out of proportion to their size, devouring field crops and food stores, and some of them carry diseases dangerous to Man and other animals. Their habits of living are remarkably varied, some of them dwelling in trees, some on the ground, some chiefly underground, and some chiefly in the water. Their food is principally vegetable matter. Some of them are valuable for their fur, notably the hare, the beaver, the beautiful little squirrel-like chinchilla, and the coypu of South America and the West Indies, from which comes the familiar nutria fur.

Despite their small size, the rodents have come to predominate over other groups of mammals because of the immense families they have, their wainness, and their ability to get a living in places where other animals would perish. All the chief rodents are described in separate articles.

Rodin, FRANÇOIS AUGUSTE (Pron rō'-dan) (1840-1917) Sketching animals in the Paris parks at six o'clock in the morning, at drawing school from eight till twelve, eating a pocket lunch to get in a hurried visit to the Louvre, clerking in the shop of an ornament maker all the afternoon, and in the evening more drawing, sometimes far into the night. This was the daily programme of the boy Rodin at 14.

A hard programme, but out of it grew one of the greatest sculptors of all time. Through the poverty and hardship of his boyhood experience came the independence and courage that fitted Rodin for his ultimate triumph. For Rodin did not follow the fashion of the day by creating idealized statues and sculptured groups that were merely graceful and pleasant to look at. He expressed in bronze and marble the sternness of life, as he had found it portrayed in gaunt lined faces about him. And, like all innovators in art, Rodin had to face an almost continuous storm of protest and abuse.

To the criticism of a public that found his work "ugly," this man from his own experience could answer, "Nothing is ugly that has life. Whatever suggests human emotion, whether of grief or pain, goodness or anger, hate or love, has its individual seal of beauty."

Still poor and unknown, at the age of 36 Rodin succeeded in showing his statue, "The Age of Bronze," at the Paris salon. It was so realistically done that the entrance jury accused the artist of having moulded the face in plaster from a living model.

An artist member of the government heard of the charge and went to watch Rodin at work. He was so impressed with the rapidity and sureness of his modelling that he himself went to the jury of the salon, declaring that "The Age of Bronze" was only one example of the realistic workmanship of this unknown artist. He convinced the jury, and the much-discussed statue was bought by the State and placed in the museum of the Luxembourg.

Fame without Riches

After this Rodin was no longer unknown, but until he was fifty years old he lived and worked in poverty. Almost every creation that came from his studio was received at first with active disapproval, followed by curiosity, half-recognition, and finally enthusiasm.

In addition to works expressing pain and despair, he has given us groups that throb with joy and ecstasy. He did many unusual things. One of the most striking was to leave his figures half cut from the marble. In many, such as "The Broken Lily," "Thought," and the monument to Victor Hugo, the unfinished figures seem to rise from the block, and yet no line is lacking to leave the impression perfect.

When Rodin was 76 years old he bequeathed to the French government the entire collection of his own works and other art objects he had acquired, together with Maison Biron, his famous Paris studio.

Rodin never acknowledged any work as his masterpiece, but the "Burghers of Calais," in its intense naturalism and dramatic energy, is the culmination of his genius. Other famous examples are his monument to Balzac, "The Kiss," "Eternal Spring," and, finally, the grand "Thinker."

Few important galleries are without examples of Rodin's art. Prior to his death he presented 20 of his works to the British people (many are in the Victoria and Albert Museum, South Kensington), and a replica of "The Burghers of Calais" was erected in Victoria Tower Gardens, Westminster, in 1918.

Roland. Among the Basque mountaineers of the Pyrenees the story still runs that on stormy nights among the mountain crags can be heard the ghostly echoes of the horn sounded centuries ago by Roland, the legendary hero of Charlemagne's army, as he lay dying at Roncesvalles (French, Roncevaux).

There have been so many tales told of Roland that it is difficult to choose the most interesting. In the Middle Ages the minstrels sang of him at castle firesides while the winter snows drifted outside, and in battle the weary and dispirited troops rallied again to the charge when they heard the glorious deeds of Roland chanted.

The best-known of all the stories were gathered into one great epic poem called the "Song of

'NOTHING IS UGLY THAT HAS LIFE'

"I Obey Nature in Everything," said Rodin, "and I Never Pretend to Command Her"



'BURGERS OF CALAIS', the famous group which stands before the Hotel de Ville in Calais, represents the six burghers who gave themselves up as a ransom for the other citizens when Edward III of England conquered Calais in 1347. They expected to die but were spared. "Their souls push them forward, their feet refuse to go," explained Rodin.



'ADAM', above, is another vigorous emotional figure of the kind which distressed Rodin's early critics. They were used to the sleek surfaces and weak structure of other sculpture of the period.

'EVE', the strong figure at the right, is Rodin's idea of the mother of mankind, no delicate and sweetly pretty feminine figure such as the 19th century critics admired 'Eve' as well as 'Adam' below are details of the artist's great design, 'The Portal of Hell'



'THOUGHT', at right, is Rodin's idea of the thinking process, not as an easy, airy, mental game, but as a struggle. The peasant girl's head, in her cap, thrusts itself gravely up from the mass of marble, which is intentionally left rough and unhewn. The head strives to free itself from the stone as a thought strives to take shape in the mind.

'LE PEN-SEUR', at left, is often called Rodin's masterpiece. The Thinker was designed to sit at the top of the Portal of Hell group, looking down in brooding despair on the unhappy story of the human race, as told in the Gates. The huge toll-er's body of this figure is a symbol of the power of real thought.



BVCI

ROLAND

Roland" This has been translated into many languages, and sung from sunny Italy to Iceland. Famous poets have written about Roland.

The legend of Roland is based on authentic history. Charlemagne was fighting the Saracens in Spain in the year 778, when he was recalled by a report of disturbances at home. As he crossed the Pyrenees, the rearguard of his army was cut off and destroyed in a narrow defile by the savage Basques of the mountains. Historians of the time tell how Count Hruodland or Roland was among those killed. In the "Song of Roland" poetic imagination has transformed the Basques into a Saracen army of 400,000,

whom Roland and his followers held at bay. "The armies clashed with cries and shouts, the whizzing of darts and the hissing of arrows," wrote the poet. The battle cry of the Franks sounded high above the confusion. Roland was ever in the forefront of the battle. His sword, Durendal, cut down the bravest and strongest of the enemy, and his powerful war horse trampled the Saracens under its hoofs.

His brother-in-arms, Oliver, called to him to summon Charlemagne's aid by sounding his horn, but he refused and the battle went on fiercer than before. But there was no resisting the overwhelming numbers of the enemy. One

by one the dauntless knights fell fighting, and soon only a few remained alive. Then Roland, knowing that death was near, raised his horn to his lips and blew a mighty blast. At once Charlemagne turned back, but it was too late. All the army was slain and Roland was dying.

Roland, MADAME (Pron *rō'-lahn*) (1754-1793) "O Liberty, what crimes are committed in thy name," cried this eminent Frenchwoman, and bowed to the clay statue of Liberty standing near the guillotine. Then, placing her head on the block, she paid with her life for her opposition to Robespierre, Danton, and their fellow terrorists.

As a child in Paris, Manon Jeanne Philpon was a great reader. In 1780 she married Jean Marie Roland, who afterwards became a leader of the Girondist party. When the Revolution came, Madame Roland became the queen of a circle of young and eloquent enthusiasts in Paris, who professed moderate republican views and opposed the excesses of the more radical party. These included not only all the famous and ill-fated leaders of the Gironde, but at first Robespierre and Danton.

When the Girondists fell, because of their attempt to guide the Revolution into moderate courses, her husband escaped from Paris to safety. Madame Roland was arrested, and in prison wrote her unfinished "Memoirs."



ROLAND, HERO OF FRANCE'S NATIONAL EPIC

The heroic exploits of the great Frankish warrior, Roland, are celebrated in many a medieval legend. The famous "Song of Roland" is based on historical fact, and tells how Roland fell in battle when the rearguard of Charlemagne's army was cut off by the Basques in the Pass of Roncevaux. Here Roland is seen at bay.

On November 8, 1793, she was carried to the guillotine along with a trembling printer, whom she asked the executioner to take first in order that her fellow victim might be saved the horror of seeing her head fall. Two days later her husband, filled with despair at her loss, died by his own hand near Rouen.

Romance. In the Middle Ages the nobles of Europe lived in lonely castles, usually perched in some inaccessible position. There were few books to read and fewer who could read them. Travel was dangerous and rarely undertaken, except for a pilgrimage or a Crusade. In such a life one can understand that visitors were eagerly welcomed. Pedlars, jugglers, mountebanks of all sorts, were constantly being entertained. Most welcome of all was the minstrel or singer. Lord and lady, children and servants, would gather round the fireplace of the great hall to hear the minstrel chant his thrilling tales of love, of war, and of mighty deeds. Through his songs ran the spirit of chivalry, the social ideal of the feudal age (See Feudal System, Knighthood). Chivalry taught knights to defend the Church, to make war against the infidel

unceasingly, to be courteous, and to keep their word no matter what difficulties arose.

Around these ideals, and around the stories of history and legend which exemplified them, the minstrel built his lays. They were called "romances" because the minstrels used one of the "Romance" languages—that is, languages derived from the old Roman or Latin tongue (See Romance Languages).

The theme of all these early romances is a quest or search. Whether it is the Holy Grail the knight is seeking, or a lost mother or father or friend, whether he is seeking forgiveness for a sin or for lack of faith in his lady, or whether he is merely seeking adventure for its own sake—there is always a quest.

The people of the Middle Ages loved to hear of heroes. In France they wanted to hear of Charlemagne, the great king who had conquered barbarian and Saracen (See Charlemagne). They liked to hear of the legendary Roland, who had died fighting bravely against great odds (See Roland). Other cycles of stories grew up about King Arthur and the Knights of the Round Table, various heroes of the Crusades, and Alexander the Great.

These romances grew sometimes to enormous length, as singer after singer embellished the tales handed down by word of mouth and added new episodes in response to the eager demands of his listeners. An immense body of romances still exists, they have been written down by various singers and later collected.

To English readers the most important group of romances is that dealing with King Arthur and the Knights of the Round Table, and the search for the Holy Grail (See Arthur, King, Round Table). In prose form the legends of Arthur are preserved in the famous work of Sir Thomas Malory, "Morte d'Arthur," and in poetry they have been adapted by Tennyson, Swinburne, and others.

These medieval romances contain the germ from which the modern novel (*q v*) has sprung, and the name "romance" has been retained to denote the type of fiction in which the imagination is given free rein.

Romance Languages.

The French, Italian, Spanish, and Portuguese languages, different as they are today, are all direct descendants of Latin, the language of the Romans. When Roman colonists spread over Europe as far north as

the German forests, they took their language with them to their new homes.

This common language of Europe underwent many curious and interesting changes when learning died out under the barbarism of the Dark Ages. Even in the days of the Roman Empire, the Latin spoken by the people in the different provinces varied considerably, and these differences, influenced by the native languages of the conquered peoples, by racial character, by geography, and by many other causes, finally transformed the various dialects into languages so entirely different that one who does not know Latin may have difficulty in seeing any point of resemblance between them.

This group of languages is called the "Romance" group, from the fact of their common descent from the Roman tongue. Because they are all derived from Latin, a knowledge of Latin is a great help in learning them. In addition to the four languages mentioned, the Romance group also includes Rumanian and several minor tongues, including a French dialect called Provençal, which was formerly spoken in the south of France and was chiefly used by the troubadours or minstrels.



MADAME ROLAND

This portrait of Madame Roland, the ardent Girondist, is from a crayon and water-colour drawing made in the prison of the Conciergerie, before her execution in 1793. Her last words were "O Liberty, what crimes are committed in thy name."
Hennin Collection

The ETERNAL CITY on the SEVEN HILLS

One of the most romantic cities in the world is Rome, where relics of ancient greatness jostle evidences of modern enterprise Its position and its buildings are worthy of the capital of a mighty empire

Rome. Rome is, in truth, the Eternal City, we may say of it that its past and its present and its future are one. Time rolls back in Rome as in a book. We walk on the very dust of Caesar, and every step we take is on historic ground.



Arch of Severus

Without doubt the "City of Seven Hills" surpasses all other cities in the world in historic interest. Not only was it the capital of the great Empire which first brought to a large part of Europe law and orderly govern-

ment and the arts of civilized life, it remained the centre of European life in the Middle Ages, and is today at once the capital of the government of modern Italy, and the seat of the Pope, the head of the great Roman Catholic Church.

Lying on the narrow river Tiber, 17 miles from its mouth, Rome has none of the advantages of a seaport, and the comparatively barren plain surrounding the low hills of the city was until recently covered with unhealthy marshes. Now, through Government enterprise, the dismal Campagna, including the stagnant Pontine Marshes, is being reclaimed and made healthy and useful as it was in the days of ancient Rome.

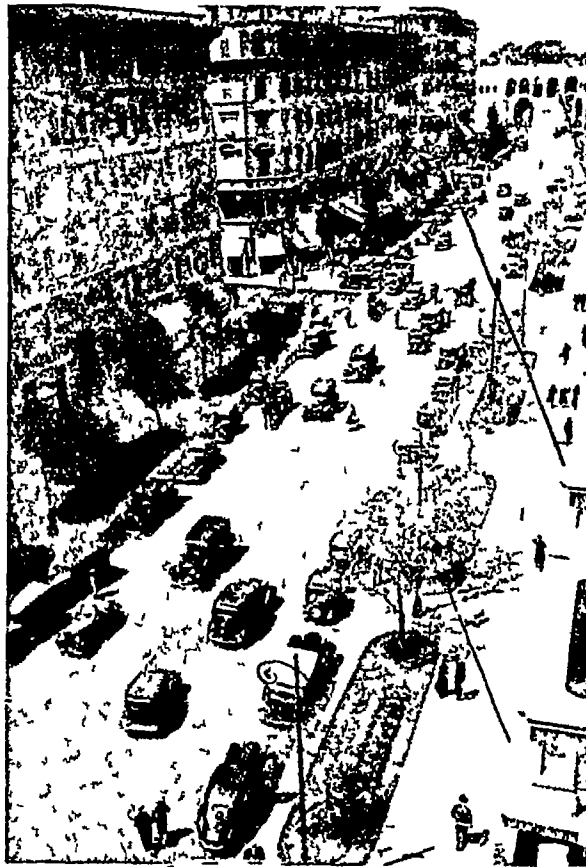
Modern Rome has expanded somewhat beyond the original seven hills—the Capitoline, Palatine, Aventine, Quirinal, Viminal, Esquiline, and Caelian hills. It now spreads over nine or ten ridges, none of which was ever very high, and

all of which have been cut down until now they are hardly distinguishable. Until 1871 Rome was ruled by the Pope as its temporal prince, and there were few residences on these historic hills. They were covered with vine yards and ruins, and the city proper was crowded down along the left bank of the Tiber on what used to be known as the *Campus Martius* (Field of Mars). The Palatine and Capitoline hills, once the centres of living Rome, with the near-by Forum, are now the chief places where one may study the ruins of the past.

Despite its ancient ruins and artistic riches, Rome today still lacks the imposing aspect of many other European capitals. The streets in great part are narrow and irregular, and palaces and hovels often exist side by side. In recent years, however, a gradual transformation has been taking place. During the first few years after the Fascists' "March on Rome" in 1922, there was little time for reconstruction, but in 1931 Mussolini launched an elaborate scheme

for rebuilding the city, which has involved the construction of four great new highways enclosing the Capitoline and Palatine hills.

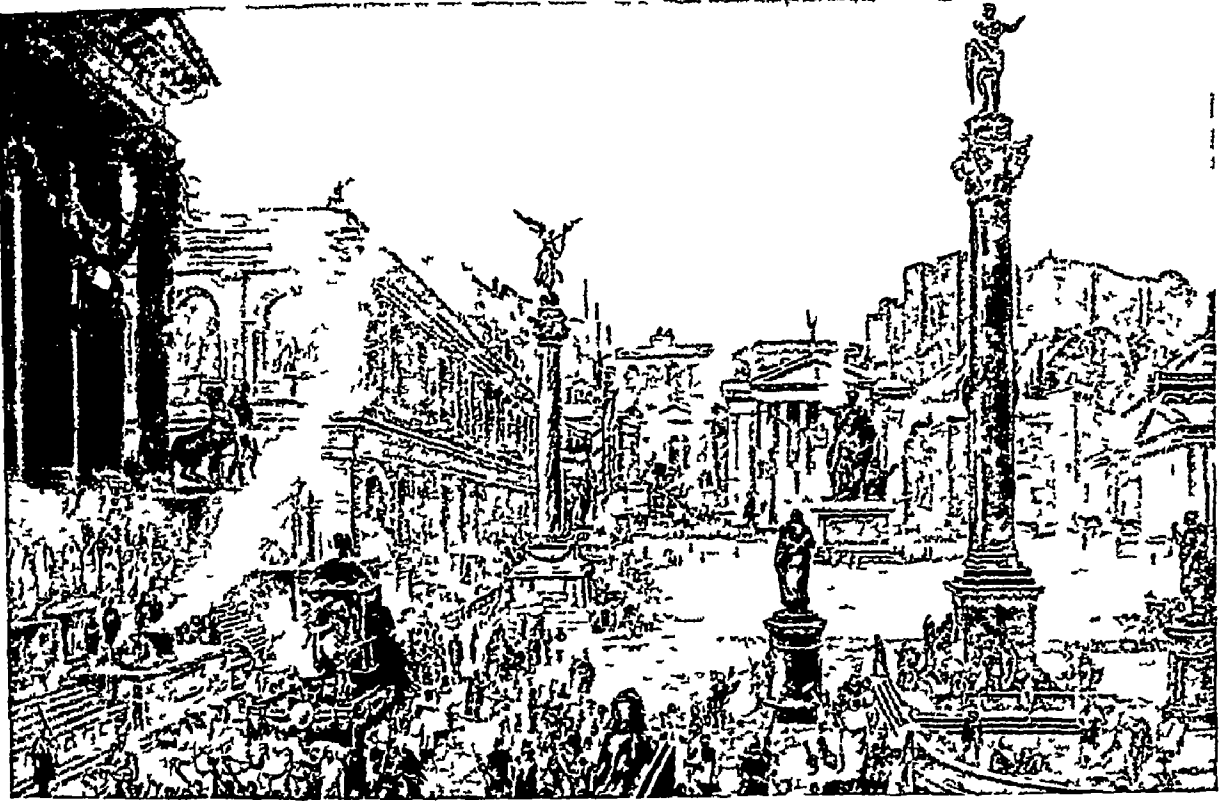
The part of the city which lies on the right bank of the Tiber is more open in appearance. Here are the Vatican and the great church of St. Peter and the broad spaces of Monte Gianicolo, the ancient *Janiculum*. The walls of the city, which on the left bank date back to the 3rd century, are about 14 miles round and are pierced by 19 gates. The most important of these is the Porta del Popolo, through which passed the ancient *Via Flaminia*, the Roman highway to northern Italy. The old Appian Way left the city by a southern gate. Remains of other great roads may still be seen, relics of that vast system



NEW STREET OF OLD ROME

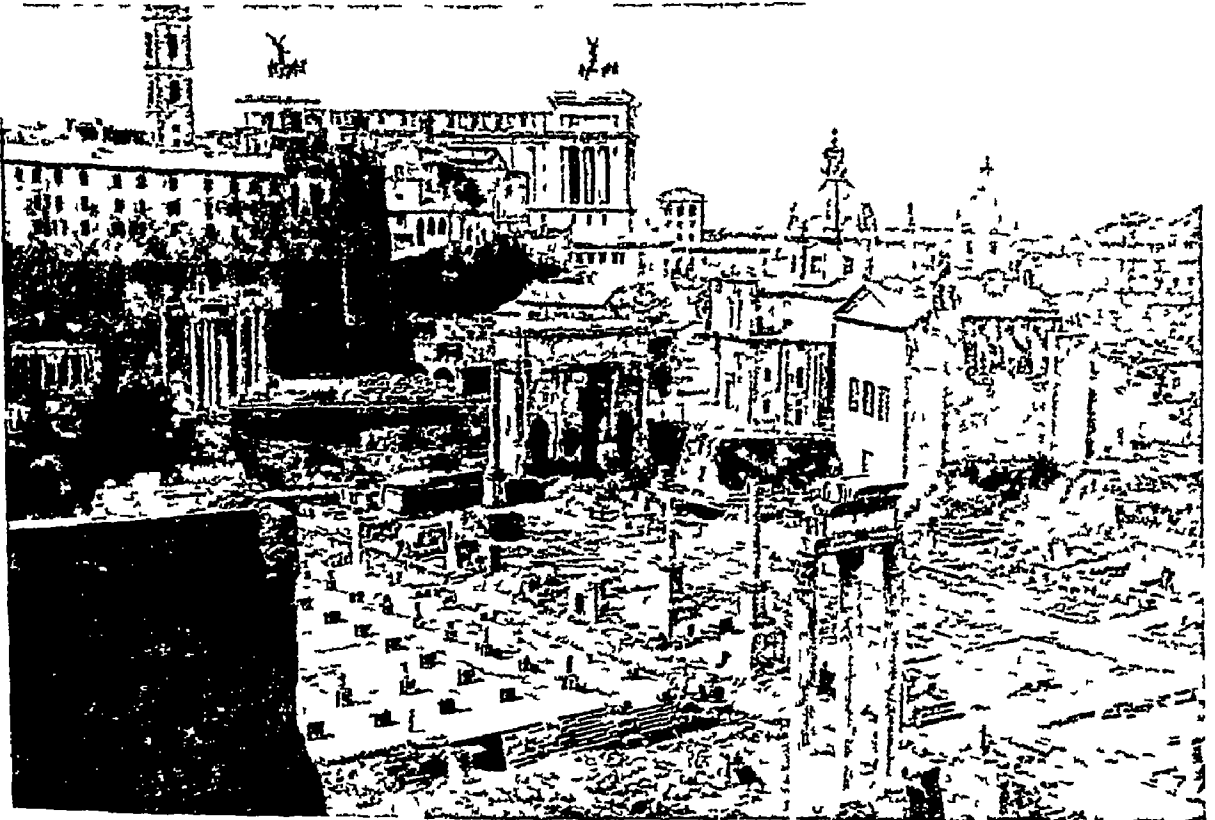
Via Vittorio Veneto, seen above, commemorates the final victory of the Italian forces over the Austrians in 1918. Running from the Porta Pinciana to the foot of the Quirinal Hill, it is lined by cafes, business buildings and offices.

ROME



ROME'S FORUM AS IT WAS IN THE AGE OF THE CAESARS

A famous painter has here rebuilt the Forum on canvas. The scene is the festival of Castor and Pollux, annually held on the anniversary of the battle of Lake Regillus. The Romans believed that the battle had been decided in their favour by the intervention of the twin gods. The temple dedicated to them (at the extreme left) was the scene of this yearly ceremonial.



TWENTY CENTURIES HAVE PASSED—THE FORUM TODAY

From the Palatine hill in Rome we see in the Forum Romanum (above) the three columns of the Temple of Castor and Pollux (right) the Via Sacra and the Arch of Septimius Severus (centre), and (left) the buildings on the Capitol, in strange juxtaposition to the very modern monument to Victor Emmanuel II in the background. The Forum (market-place) was founded in 179 B.C.

Photo Donald McLeish

ROME

which once stretched over a very great part of Europe, when "all roads led to Rome"

Between these two parts of the city the Tiber has a winding course of three miles, confined between stone embankments built in modern times to guard against its fierce floods. A dozen bridges connect the two portions of the city. One of the chief streets of Rome today is the Corso Umberto Primo, which leads from the centre of the old city out through the Porta del Popolo, it is named in honour of King Humbert I (1844-1900), who succeeded Victor Emmanuel II, first King of modern Italy.

The latter is also commemorated in modern Rome by the huge monument known as the "Vittoriano," which overlooks the centre of the city between the Piazza Venezia (on the north) and the Capitol and Forum (to the south).

Watching the Roman Crowd

The throngs of modern Rome present a cosmopolitan aspect hardly exceeded by Paris. Tourists from all quarters of the globe, soldiers in gay uniforms, *carabinieri* or military police with plumed hats, black-robed priests, and sandalled monks in brown or grey or white mingle with the peasants from the hills, while among them runs the dense motor traffic of a modern capital city.

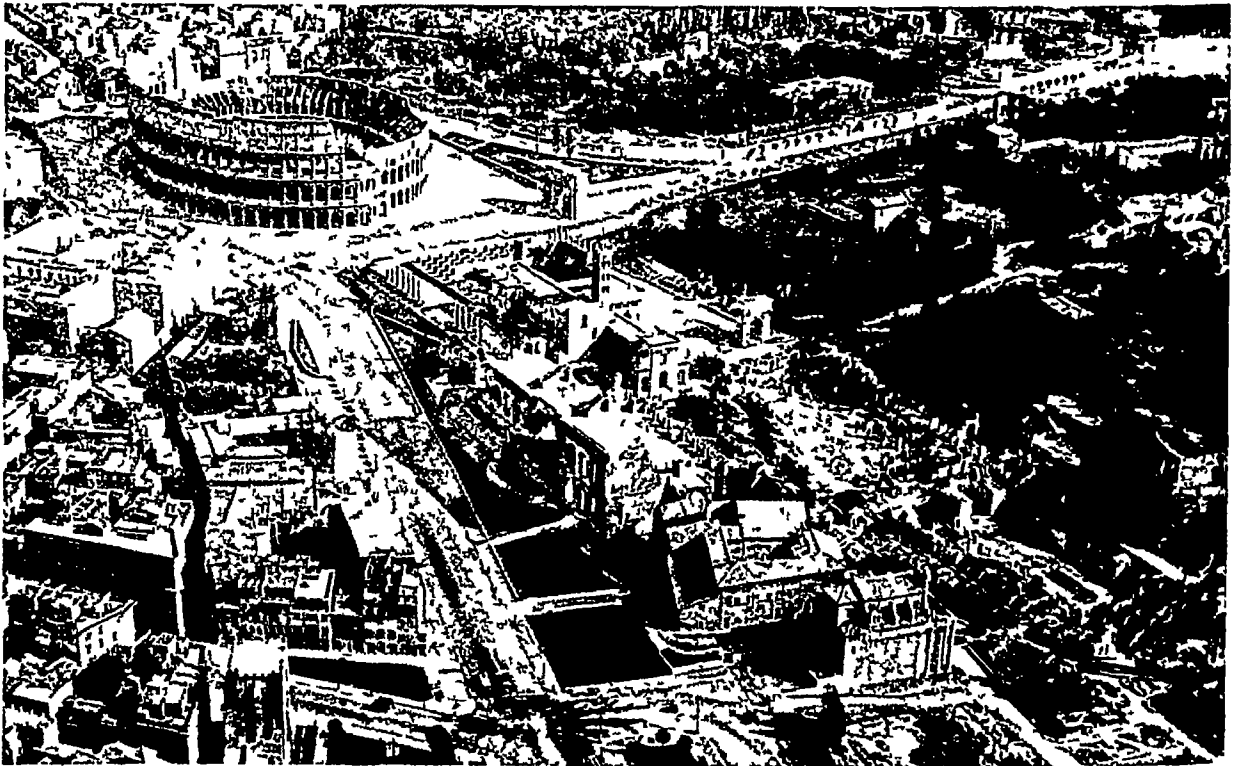
The Vatican hill is situated in the extreme north-western corner of the city, and the Papal residence, which was begun in the 13th century,

while the Popes still lived in the Lateran palace at the opposite end of Rome, was primarily designed as a sort of fortress in which the Popes might be safe from attacks of foes inside and outside the city. The walls which almost completely surround it were built when the Popes took up their permanent residence there in 1377. From behind these walls and with all approaches guarded by the Castle of Sant' Angelo—the massive tomb of the emperor Hadrian, long ago converted into a powerful fortress—the Papal lords of Rome could easily dominate the city. Many years afterwards—in 1929—Mussolini, as Italy's new master, concluded treaties with the Pope, by which the Holy See of Rome (including, of course, St Peter's) is recognized as an independent sovereign State. (See Vatican)

The palace of the Quirinal, which since 1871 has been the residence of the Kings of Italy, is situated in the exact centre of the old town.

It is impossible to give a list of the many churches and palaces which possess historic and artistic interest. For centuries Roman pontiffs and cardinals and the Roman nobility vied with one another in erecting magnificent palaces and places of worship. Next to St Peter's, the church of St John Lateran is perhaps the most important. It is the mother church of Rome and was the scene of the five Lateran councils.

Among the palaces made famous by the names of the great nobles are those of the Borghese, the

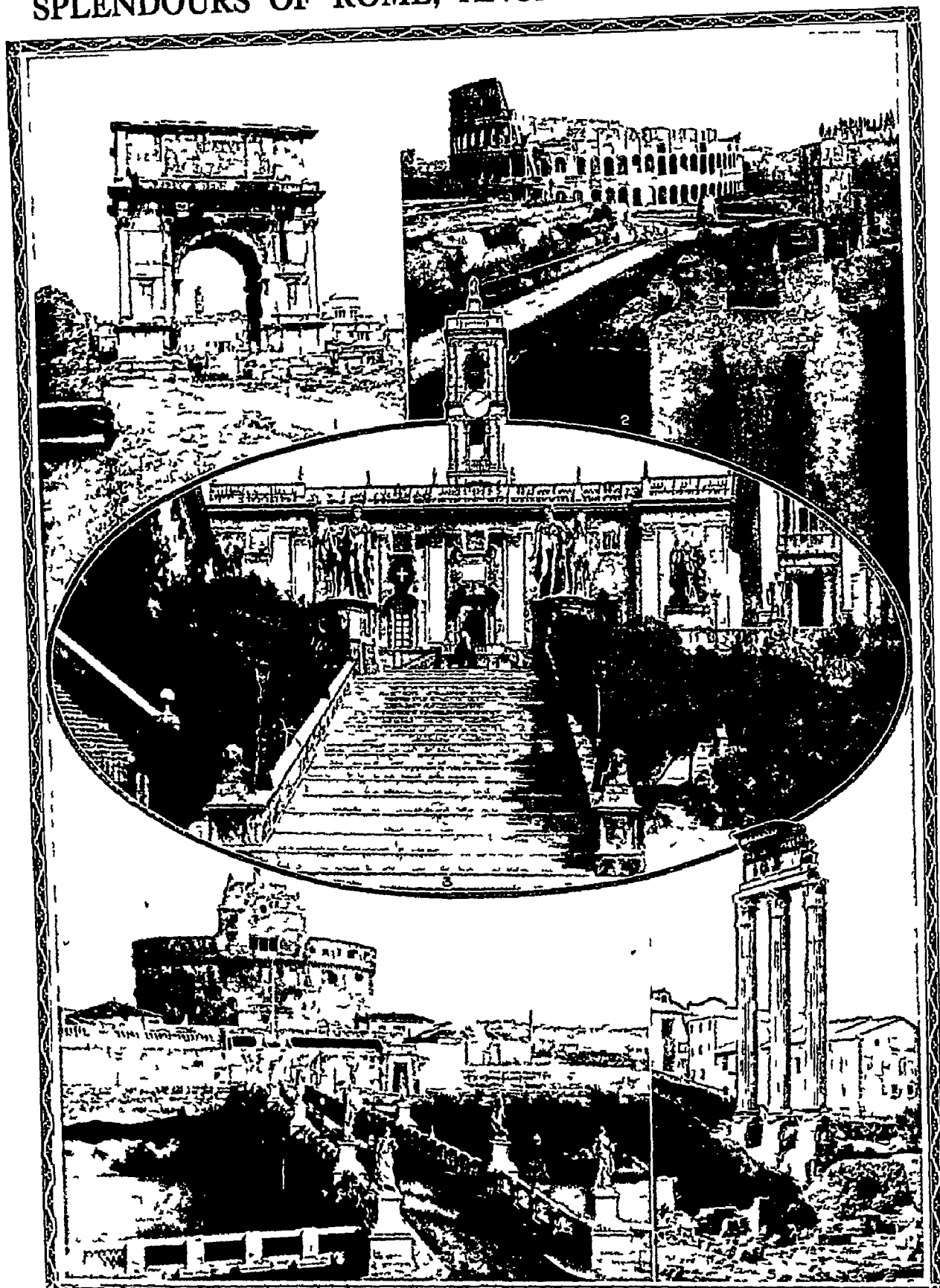


FINE NEW ROADS IN MUSSOLINI'S ROME

Wide World Photos

Above, you see the Via dell' Impero, a magnificent new road which links the Victor Emmanuel Monument with the Colosseum, seen in the top left-hand corner. The road which goes from the Colosseum to the right, passing by the Arch of Constantine, is the Via dei Trionfi. These two new avenues are among Mussolini's greatest road-building achievements. The Via dell' Impero was inaugurated on October 28, 1932, the tenth anniversary of the Fascist march on Rome. The Via dei Trionfi was opened exactly a year later, and follows the course of the Triumphal Way of ancient Rome.

SPLENDOURS OF ROME, ANCIENT AND MODERN



1 The Triumphal Arch of Titus, conqueror and destroyer of Jerusalem. 2 The Colosseum, built in the reign of Vespasian, and long the scene of gladiatorial contests and other games. It could accommodate 50,000 spectators. 3 Palace of the Senators, which houses the civil administration of the modern city, its façade was built in 1591 from designs by Michelangelo. 4 Castle Sant' Angelo, built by Hadrian as a mausoleum, for fifteen centuries the fortress of Rome, connected with the Vatican by a secret underground passage, but now only a showplace. 5. Ruins of the Temple of Castor and Pollux, on the south side of the Forum.

ROME

Farnese, the Rospigliosi, and the Colonna. These were built in the turbulent days when a man's home was literally his castle, and many a murderous fight was fought before these doors between defenders within and besiegers without.

Few buildings of the days of the republic or early days of Christianity remain standing in Rome today. In view of the violence suffered by the city during many centuries, it is surprising that a single stone is left in place. A dozen times enemy forces camped within the walls and gave the city over to pillage. On five of these occasions immense damage was done. The Gauls thoroughly plundered the city in 390 B C. Alaric and his Visigoths sacked Rome just 800 years later, in A D 410. The Vandals followed close on the footsteps of the Goths in 455, and by their furious destruction created the word "vandalism." In 1084 the Normans of southern Italy, who had been called in by the Pope, seized the opportunity to plunder the city. And finally the soldiers of "his Catholic majesty" Charles V, Emperor and King of Spain, ravaged Rome in 1527.

But despite the assaults of time and man, many remnants of Rome's ancient glory remain, for the Roman emperors built solidly and on a vast scale. During recent excavations the ground plan of the city of the Caesars has gradually been brought to light. Perhaps the most famous series of ruins is to be found in the great

Forum at the foot of the Palatine hill, including the remains of at least seven temples. The best preserved of the ruins is the Pantheon, which has been the model for modern classical architecture.

Everyone has seen pictures of the Colosseum, the great ruin which still stands in the midst of modern Rome. When it was dedicated as an amphitheatre for gladiatorial combats and other excitements of the "Roman holiday" by the emperor Titus in the year A D 80, it was probably the most imposing building in the world.

Outside the city are the Catacombs, subterranean galleries where the early Christians buried their dead and gathered to worship in times of persecution. (See illustration, page 1013)

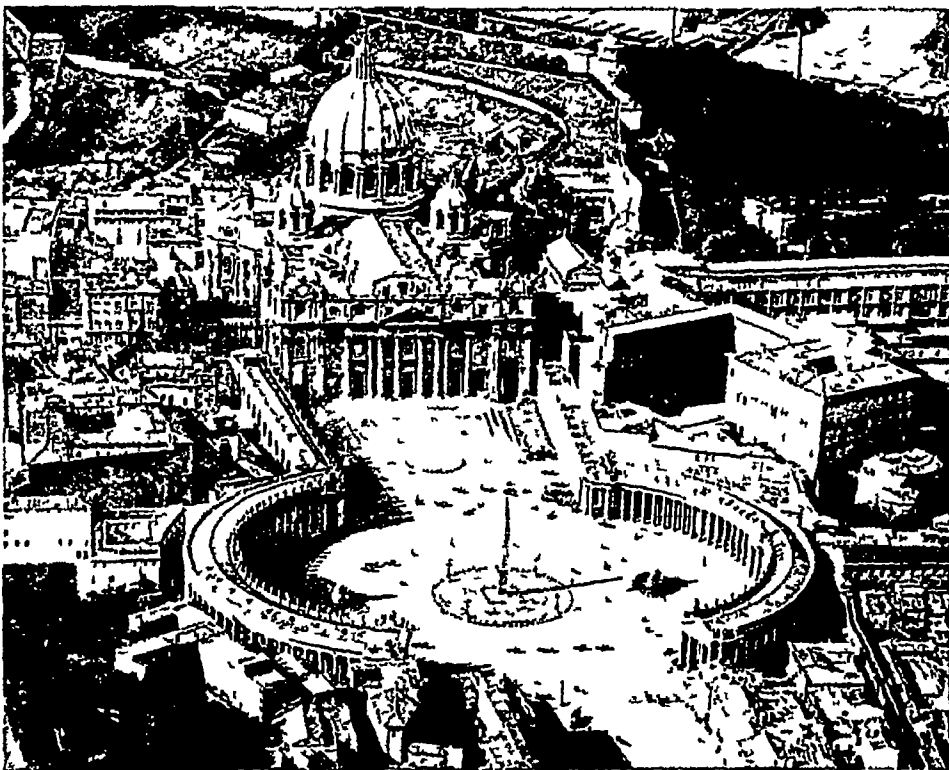
Public Baths of Old Rome

It is said that when the Romans began the habit of taking hot baths, the downfall of their empire set in! Their love for this form of luxury—for in those days of primitive plumbing it was a luxury—is shown by the many remains of *thermae* or bathing palaces scattered throughout the empire. The most noted of these in Rome are the baths erected by the emperors Caracalla, Diocletian, Nero, Titus, and Trajan. The great sewer, *Cloaca Maxima*, was another marvel of ancient Rome.

Because of its many objects of historical and artistic interest, Rome today remains one of the great cultural centres of the world. Of its many scientific and literary institutions, the university

of Rome is the most important. The Catholic Church maintains several large colleges for training priests and missionaries. There are besides innumerable schools of art, architecture, and music.

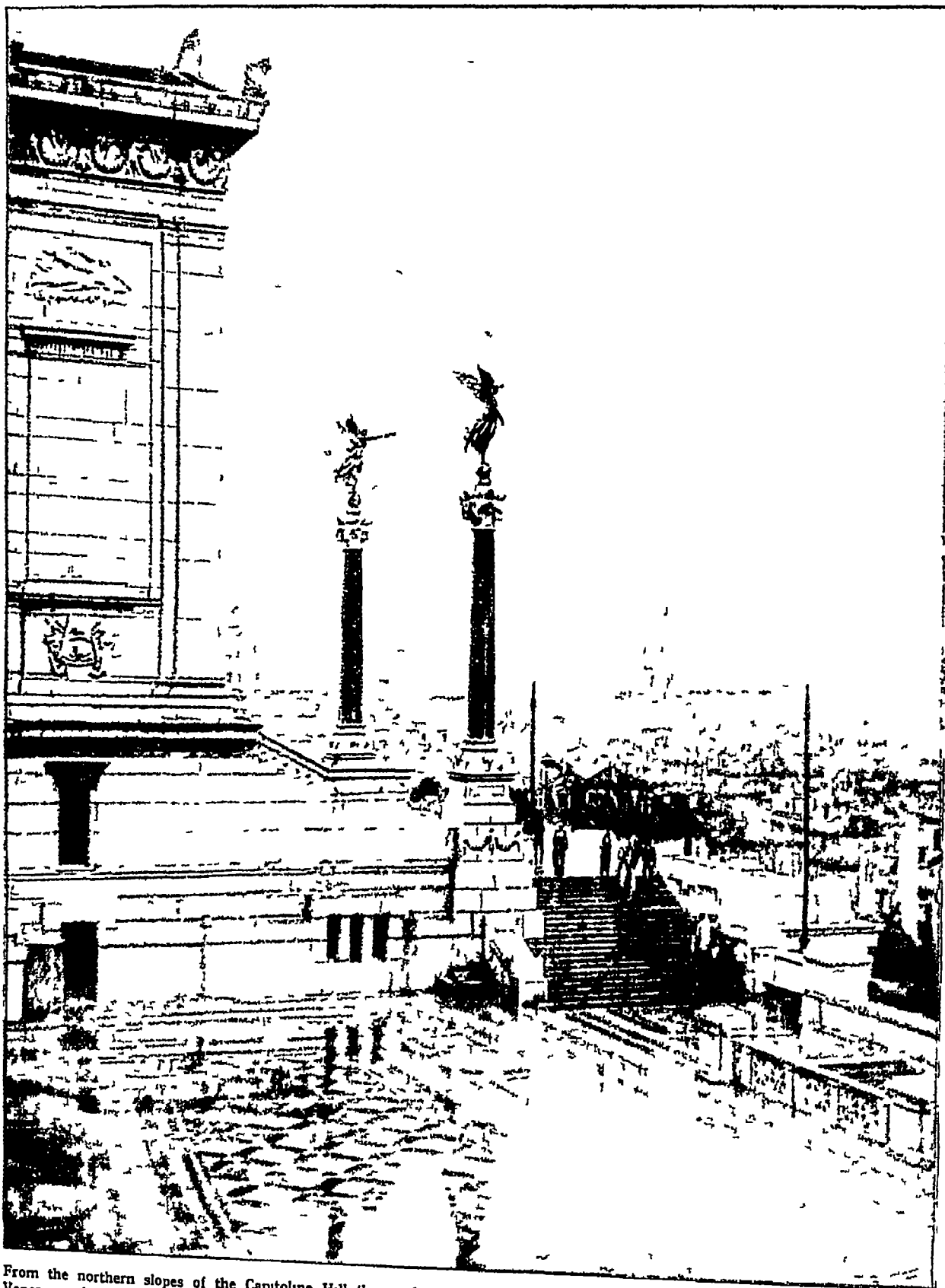
Under the Fascist regime, miles of slums have been cleared away. Great new buildings, notably the Air Ministry and the 40-acre University City, have sprung up. To ancient Ostia, and Lido di Roma, a new coast resort, runs one of the *Autostrade* (motor highways). On the Mussolini Forum, in the shadow of the Mussolini Obelisk, every kind of sport can be pursued. The population of Rome is 1,155,000.



FAR-FAMED ST. PETER'S FROM THE AIR

The Basilica of St. Peter in the Vatican, one of the most famous churches in the world, occupies the traditional site of the burial of St. Peter, said to have been crucified head downwards on the slopes of the Vatican hill. Since 1929 the Vatican has been an independent City State, under the direct sovereignty of the Pope.

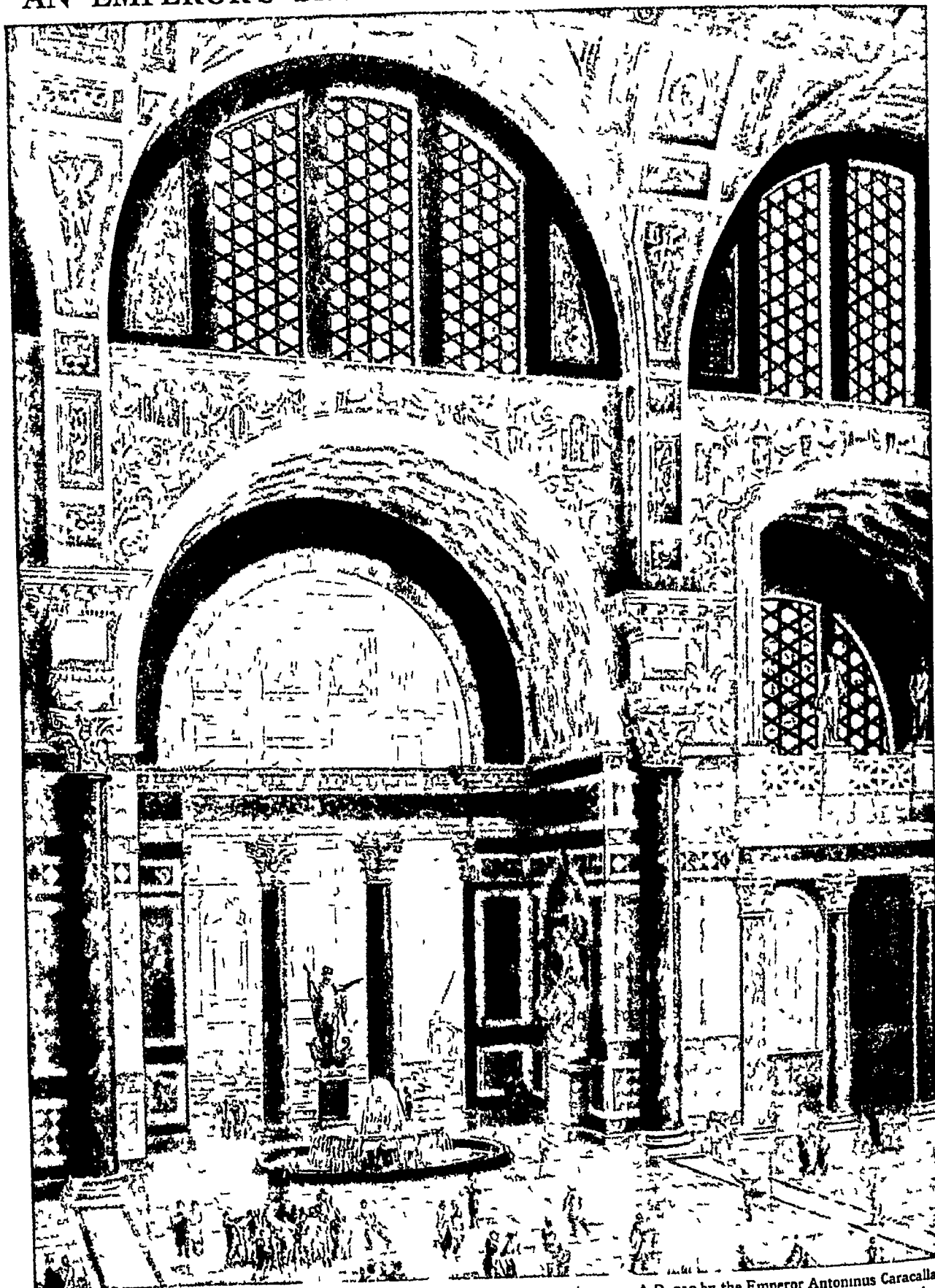
MODERN ROME'S MONUMENT TO ITALIAN UNITY



From the northern slopes of the Capitoline Hill the mighty monument to Victor Emmanuel II looks down upon the Piazza Venezia and over a vast panorama of the Eternal City. In the distance are the massive domes of three of Rome's churches. Popularly known as the Vittoriano, this monument, finished in 1911, symbolizes the birth of a united Italy under a single king in 1861. It now contains the tomb of Italy's Unknown Warrior.

Donald McLeish

AN EMPEROR'S BATHS AS THEY WERE IN HIS DAY



The Baths of Caracalla in Rome, the imposing ruins of which still remain, were begun in A D 212 by the Emperor Antoninus Caracalla. The central building was 750 feet long and 500 feet wide, surrounded by gardens, and it not only offered every facility for bathing, but included libraries, picture-galleries and lecture halls. Here is an artist's impression of what these wonderful baths, which could be used by 1,500 people at one time, looked like in their heyday. This portion was the Tepidarium, or warm-water bath.



Rome, HISTORY OF When the curtain rises upon the pageant of Roman history, it discloses the destined mistress of the world as a tiny settlement on the Palatine hill, one of the famous seven hills about 17 miles from the mouth of the Tiber, in central Italy. At this point the river was easily fordable, and so merchants from the south had settled here to trade with the powerful, wealthy, and more civilized Etruscans, who occupied the lands to the north.

The settlement of the Palatine was made largely by men known as "Latins," who dwelt in the little plain of Latium (the modern Campagna). On the neighbouring hills were other settlements, the most important of which seems to have been made by Sabines. They, like the Latins, were one of the Italic peoples which had moved down from the north about 1000 B.C. and conquered the original inhabitants of the peninsula, a dark people of the so called "Mediterranean" stock.

The various settlements on the seven hills finally joined to make one city. At the outset the Latin chieftains ruled, but before long—perhaps as early as 750 B.C.—the community fell into the hands of Etruscan princes from across the Tiber. Under their enlightened though despotic rule, Rome grew steadily in importance and power, and great temples and

public works were constructed, notably the huge sewer, the *Cloaca Maxima*, which exists to this day. After about two and a half centuries, however, their cruelty and tyranny caused a revolt, and they were expelled.

Legend relates how Romulus ruled for 37 years after he founded the city in 753 B.C., and how he was followed by Numa Pompilius, a wise and pious ruler who, under the guidance of the nymph Egeria, is said to have taught the Romans the arts of peace and the worship of the gods. Under his successor, Tullus Hostilius, the Romans conquered Alba Longa, the religious centre of the Latin people.

In this war took place the famous contest between the Horatii and the Curiatii, three brothers from the opposing sides, who were selected to decide the struggle by personal combat. The Roman champions won, and not long afterwards Alba Longa was destroyed and its people moved to Rome.

During the reign of Ancus Marcius, the next king, many troublesome Latin cities were conquered and some of their inhabitants brought to Rome. This ruler is said, also, to have built Rome's seaport Ostia at the mouth of the Tiber.

Tarquinius Priscus, the first of the Etruscan kings, drained the city, improved the Forum, founded a temple to Jupiter, and carried on many wars with the neighbouring peoples.

ROME · HISTORY

Under Servius Tullius, the sixth king, a treaty was made with the Latin cities acknowledging Rome as the head of all Latium. Servius Tullius considerably enlarged the city, the story goes on to tell, and built a wall round the seven hills.

Rome Becomes a Republic

The last of the kings, Tarquinius Superbus, was a tyrant and oppressor of the people. He scorned religion, but was induced to buy the famous Sibylline books, which thereafter were the chief guidance of Rome in the hour of need. A rebellion against him was led by Junius Brutus, who drove him from the throne (509 B.C.). Rome now became a republic.

Four times the banished Tarquin attempted to regain his power. First, he enlisted the aid of Brutus's two sons. When their treachery was discovered, the stern old father, true to the ancient Roman ideal of duty, condemned them both to death. Next, the men of Veii and Tarquinii, two Etruscan cities, marched on Rome to force Tarquin's restoration. Brutus was slain in the fight, but the Romans won.

Next, Lars Porsena, an Etruscan prince, appeared before the gates of Rome. The city was saved only by the heroism of Horatius

Cocles and two companions, who held off the whole Etruscan army while the Romans destroyed the bridge (as you may read in the story accompanying the article on the river Tiber). Finally, Tarquin stirred up his son-in-law, Octavius Mamilius, chief of all the Latins, to lead a revolt. But the Latins were crushed in the famous battle of Lake Regillus, in which, according to legend, the Romans were aided by Castor and Pollux.

The young republic, which now set out on its long career of almost incessant warfare, was far different from the great republics of today. It was only a tiny city state, much like the city states that were flourishing at the same time in Greece. Its area was less than 400 square miles, and its population perhaps 150,000. The chief power was in the hands of the wealthy and aristocratic citizens, called the "patricians," who were supposed to be the descendants of the three original tribes of Rome.

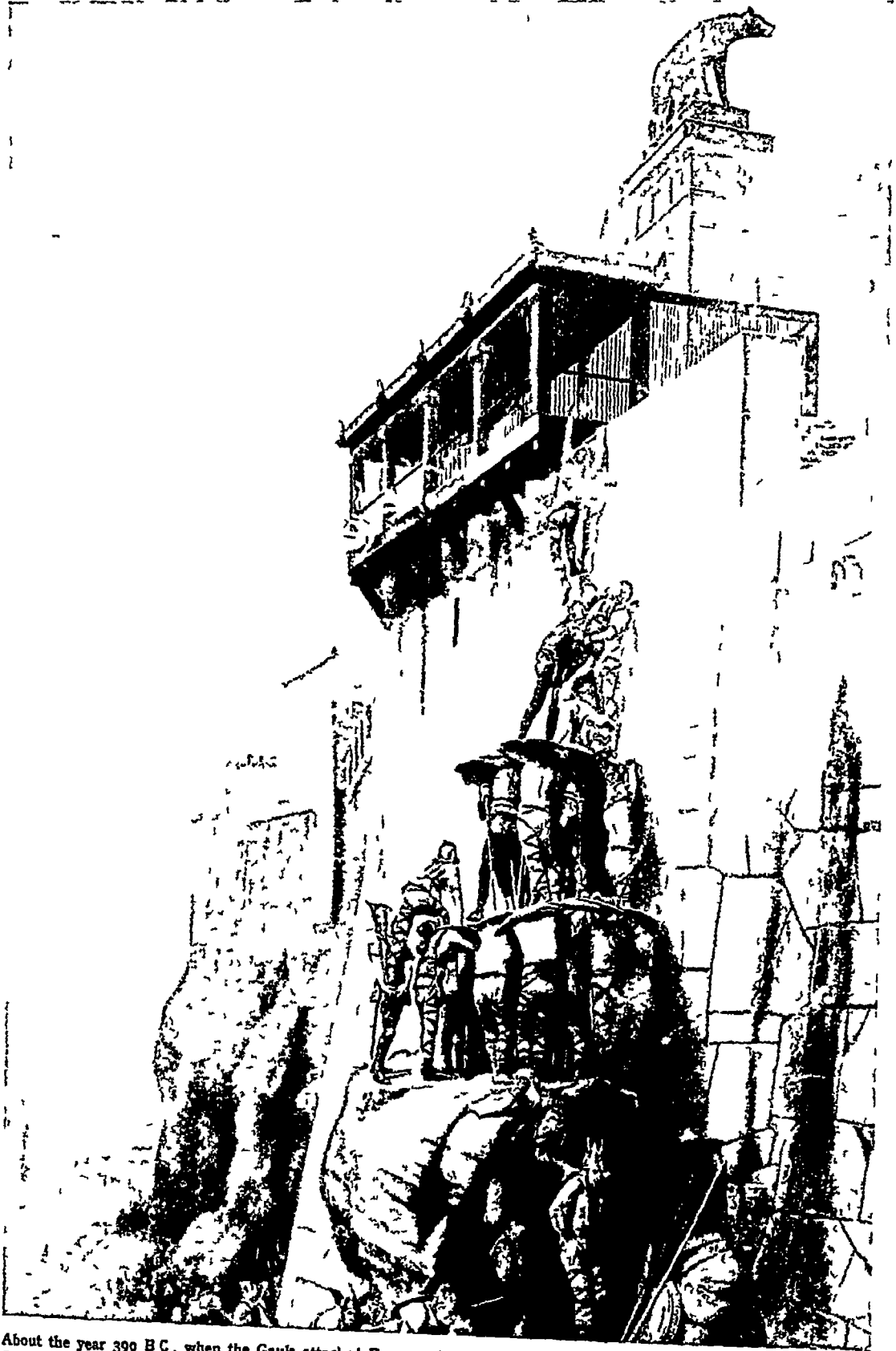
The common citizens, the "plebs" or "plebeians," at first had little more to do with the business of government than they had had in the days of the kings. But gradually they tore down the barrier separating the two orders.



AT THE CENTRE OF ROME'S LITERARY CIRCLE

Virgil is reciting a poem, perhaps one of the *Georgics*, in which he celebrates the husbandman, or a part of the *Aeneid*, written to the glory of Rome, while laurel-crowned Horace waits his chance to read an ode or two. The bald-headed man on the right is Maecenas, a lover of the arts and letters and a generous man of wealth, to whom not only Virgil and Horace but many other Roman writers owed much. His name has ever since been a synonym for a patron of poets and painters.

HOW ROME WAS SAVED BY HER SACRED GEESE



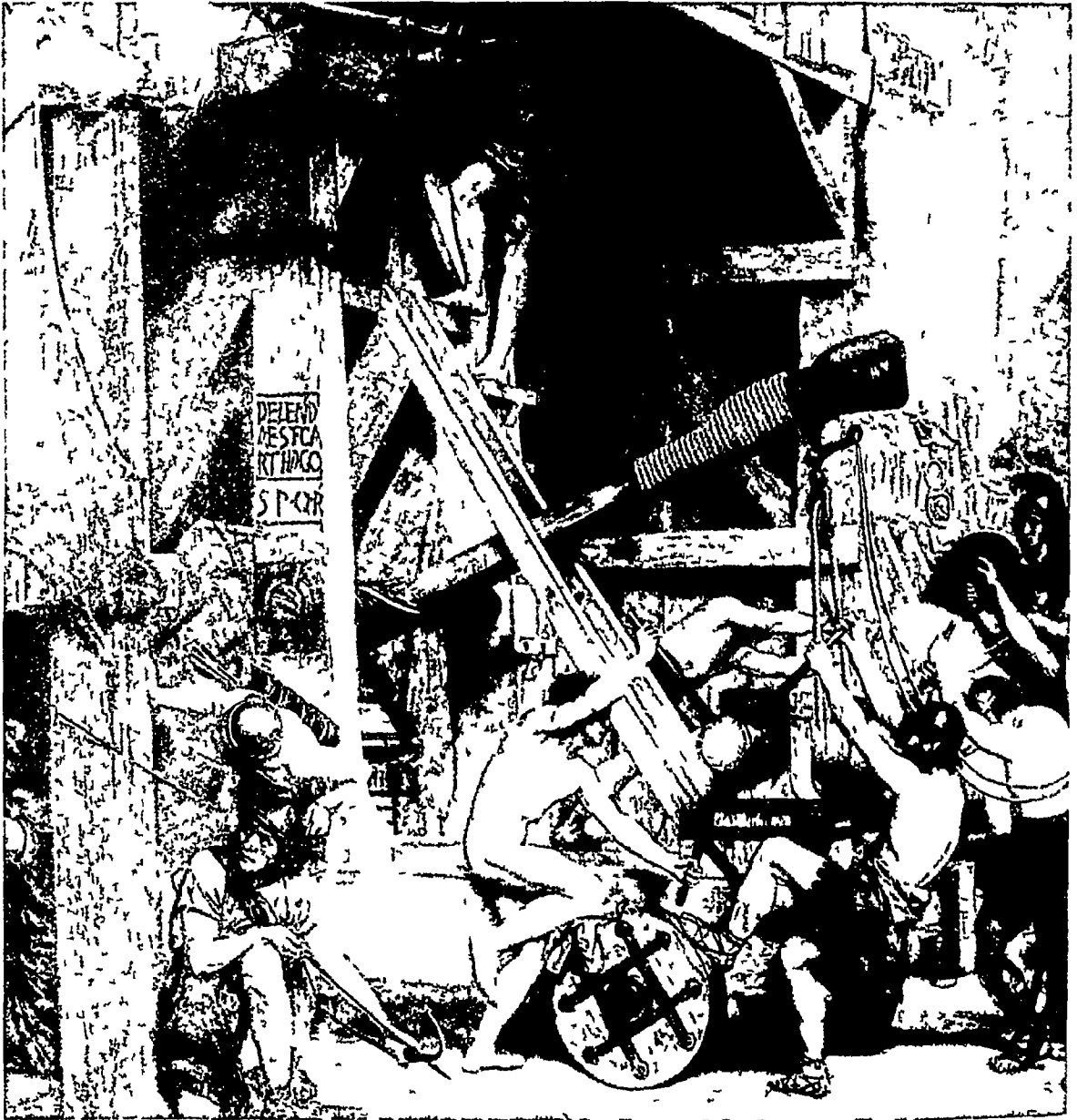
About the year 390 B.C., when the Gauls attacked Rome and speedily occupied the lower parts of the city, the steep Capitoline hill remained unconquered. According to legend this also would have fallen to a surprise attack of the Gauls, had not the loud cackling of the sacred geese of Juno warned the defenders in time. Here is an impression by the French artist Henri P. Motte of the Gauls scaling the wall beneath the geese's cage.

ROME: HISTORY

In the early days of the republic the ruling power was divided between two patrician magistrates, elected for one year. These were the "consuls." The assembly in which they were chosen, the *comitia centuriata*, was made up of divisions apportioned in such a way that votes of the patricians counted for much more than those of the far more numerous plebeians. The Senate, the most important political body, consisted of 300 men chosen by the consuls from among the patricians. Thus shut out from office and political power, the plebeians were grievously oppressed by their more wealthy fellow citizens. Then, to redress their wrongs the plebeians, in

494 B.C., marched out of Rome in a body and threatened to make a new city. This so terrified the patricians that they agreed to cancel all debts and release those imprisoned for debt. Furthermore, the plebeians were granted the right to be represented by new officials, called "tribunes," who should have the power to veto the act of any magistrate which bore unjustly on any citizen.

The plebeians soon won recognition for an assembly of their own (the *concilium plebis*), and forced the appointment of a commission of ten men (*decemvirs*) to put the laws of the state in writing and have them engraved on 12



ROMAN CATAPULT IN ACTION BEFORE CARTHAGE

Carthage, rich and important city of the ancient world, was continually harassed by Rome. After the third Punic war, which lasted from 149 to 146 B.C., Carthage, despite an heroic resistance, fell before the might of the Roman armies and was utterly destroyed. Before the invention of gunpowder the catapult was the military engine employed for siege work, and here we have an artist's idea of how the Romans used their ballistas, or heavy catapults, when laying siege to Carthage. Like an arm with a clenched fist, it was used to hurl blocks of stone against or over the walls.

Painting by Sir Edward Poynter P.R.A.

ROME: HISTORY



TOOLS AND UTENSILS USED BY THE ROMANS OF THE EMPIRE

1 A Roman lantern found near Pompeii 2 Medical instruments 3 Pottery vase, showing typical ornaments 4 Baking pan for small cakes 5 A glass urn to hold ashes of the dead. 6 Iron sword and bronze-plated scabbard, found in the Thames near London 7 Scissors, thumb, and two keys 8 Saw, hammer-head and set-square 9 Saucepan, found in England. 10 A strainer 11 A bronze jug

tablets of bronze (450 B C) They gained the right of intermarrying with the patricians, and obtained admission to various public offices

The chief of these, which were established to relieve the consuls of the growing burdens of administration, were those of *quaestors*, or treasurers' *censors*, who kept the lists of the citizens, assessed taxes, and supervised public morals, and *praetors*, or judges

The struggle was long drawn out, and it was not until 367 that it was decided that one of the two consuls should be a plebeian In 350 the plebeians were admitted to the dictatorship, which was an extraordinary magistracy whereby

supreme power at critical times was given to one man (See Cincinnatus)

Admission to these offices carried with it admission to the Senate, since vacancies were filled from those who had last been elected to public office The members were appointed for life, and executives were bound to submit all important measures to it In theory it was a purely advisory body, but since its members were ex magistrates, representing the highest ability and influence of the state, any advice it gave was almost certain to be accepted

The growing power of the plebs was marked by the gradual rise of a new voting body, the

ROME HISTORY

comitia tributa, in which one man's vote counted for as much as another's. This developed from the plebeian assembly (*concilium plebis*, which still continued to meet) by allowing patricians also to participate. After the passage of a law (*lex Hortensia*) in 287 B.C. making the acts of the plebeian assembly binding on all the people, these two bodies made most of the laws.

The Rich Plunder the Poor

Side by side with the struggle for political power went on the economic struggle between rich and poor. The wealthy landowners continued to increase their estates, appropriating the best of the lands and increasing their herds until they monopolized the public pasture. They continued the practice of lending money at ruinous interest to the small proprietors, reducing them to slavery when they could not pay. Moreover, the population of Rome was increasing too fast, and the soil was made poorer by primitive farming methods.

The burden of constant warfare fell most heavily on the plebeians, who had to leave their little farms to fight the state's battles. Gradually, however, reforms were forced through, chief of which were the Licinian laws of 367, which again revised the debt laws, limited holdings to 300 acres, and compelled the large landowners to employ a certain proportion of free labourers.

The most formidable of Rome's early foes had been the Etruscans. With their greater numbers and superior civilization, the Etruscans would probably have reduced Rome to vassalage but for the destruction of their fleet in a war with the Greek city of Syracuse in Sicily (474 B.C.), and the constant pressure of the Gauls from the north, who swarmed into the Po valley toward the end of the 5th century and laid waste the Etruscan cities of the north. Thus aided, the Romans had finally been able (396 B.C.) to take, after a ten years' siege, the powerful Etruscan stronghold of Veii, eight miles from Rome.

The Latin League and the Gauls

In its conflicts with this foe and with neighbouring Italic tribes (chiefly the Aequians and Volscians) Rome was supported by the other Latin cities to the south, which were united under the name of the Latin League and had made a treaty with Rome for mutual defence. The victorious progress of Rome received a temporary set-back in 390, when wandering Gauls advanced through the heart of Etruria, laying waste the land as they went, and capturing and sacking Rome. Legend tells how the garrison on the Capitoline hill was aroused in the nick of time by the cackling of the sacred geese, and repulsed the storming party.

After a fruitless siege the Gauls accepted a heavy ransom and returned to the valley of the

Po. Though Rome had been burned, the Etruscans had suffered far more in the invasion, and were so weakened that Rome was able to seize their southern possessions and in another century to conquer their whole territory.

Meanwhile the Latin League had become restive under the growing power and arrogance of their ally and attempted to break away from its control. From the two years' war which followed (340-338) Rome emerged victorious, reducing some of the towns to vassalage, giving others full Roman citizenship, and others partial citizenship—what was known as the "Latin right."

Another formidable foe in central Italy still remained to be reckoned with—the Samnites, who were also of Italic stock. The first conflict with this warlike people (343-341) had been interrupted by the Latin revolt. The truce then made was broken a few years later (326), and a desperate struggle continued, with interruptions, until the decisive battle of Sentinum (295) made Rome supreme over all central and northern Italy.

Rome Mistress of All Italy

Only southern Italy, occupied by a disunited group of Greek city states, remained independent. Its fate was not long delayed. Alarmed at the spread of Roman power, the Greek cities appealed to Pyrrhus, King of Epirus, in Greece. He inflicted two telling defeats on the Roman army, and then crossed to Sicily to help the Greek cities there to throw off the yoke of Carthage. Encouraged by the arrival of a Carthaginian fleet, Rome renewed the struggle, and in 275 repulsed Pyrrhus in the battle of Beneventum. One by one the Greek cities of the south were taken, and Rome was mistress of all Italy.

Nowhere did Roman genius shine with greater brilliancy than in the system which was gradually devised to weld these immense conquests into a contented and unified whole. To many of the conquered cities of Italy were granted the privileges of Roman citizenship, in full or in part, as had been done with the Latin cities. Most of them were given the status of "allies," with self-government and the right to trade and intermarry in Rome, but not to vote. Furthermore, all Italy was dotted with colonies of Roman citizens, most of whom retained their full civic rights. Considerable territory, nearly one-sixth of all Italy, was annexed and distributed among Roman citizens.

Two centuries of warfare had now made Rome a nation of soldiers. Her only remaining rival in the western Mediterranean was the Phoenician colony of Carthage, which was the chief naval power, as Rome was the chief land power. Carthaginian warships made the western Mediterranean a closed sea, and sank

ONE OF THE 'OLD SCHOOL' OF ROMANS

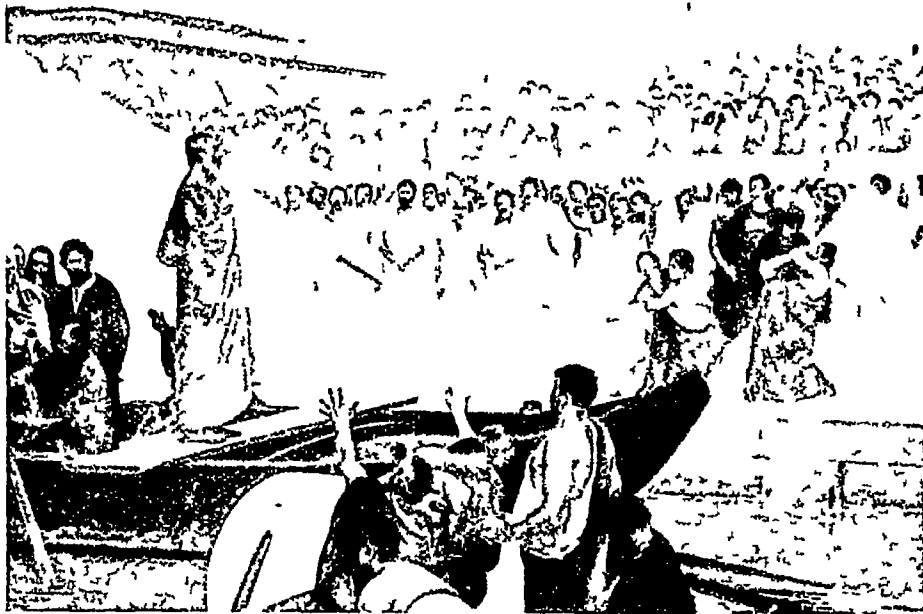


M. C. C. Dentatus who was consul in 290, 275 and 274 B.C., was celebrated in later times as an example of Roman frugality and simplicity. After conquering the Lucanians, Bruttians and Samnites he refused all honours and retired to his small farm in the country. It is said that Samnite ambassadors finding him there cooking vegetables in an earthen pot asked to take him with costly presents. These he refused saying he desired rather to rule over those who had wealth than to possess it himself.

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the trading vessels of any other city which dared to bid for a share of the commerce of this region.

Such a condition was intolerable to the pride of Rome, and in 264 B C began a conflict for Mediterranean supremacy (the Punic Wars), which continued with interruptions until Carthage was finally destroyed in 146, and in which the courage and endurance of Rome were tested to the utmost. But the stern devotion to duty, which was the keynote of Roman character, prevailed in the end, and after the battle of Zama (202 B C) Carthage was reduced to the status of a vassal state. Fifty years later, with savage vindictiveness, Rome again attacked her prostrate rival and razed the city (Third Punic War) (See Carthage, Hannibal).



REGULUS LEAVES ROME FOR CARTHAGE

Marcus Atilius Regulus was a famous Roman general of the First Punic War (264-241 B C), who defeated the Carthaginian fleet at Ecnomus in 256 B C. An expedition to Africa followed, in which Regulus had defeated the Carthaginians and nearly reached the capital when he was, in turn, defeated by Xanthippus. This painting, by Maccari, in the Senate House at Rome, shows Regulus leaving Rome for Africa.

Rome was now well launched on her way to world dominion. Upper Italy (*Gallia Cisalpina*), Sicily, Spain, Macedonia, Greece, and Asia Minor were subdued and made Roman provinces. Intoxicated with their sudden rise to imperial power, the new generation of statesmen gave themselves to aggression and spoliation.

Most of the conquered lands were administered by governors (*proconsuls*), who ruled like Oriental despots with the sole aim of amassing in their one year of office wealth for a lifetime. Such enormous taxes were wrung from the subject peoples that they not only defrayed most of the expenses of the Roman state but enriched the greedy tax-farmers (*publicani*), who purchased the privilege of collecting the taxes.

Wealth poured into Rome from the four corners of the globe, and the ancient simplicity of Roman life gave way to Asiatic luxury and pomp. The suddenly-enriched office-holders acquired estates, buying up the little farms of the poor peasants, who could not compete with the hordes of slaves that worked the great plantations. The streets of the capital were flooded with a poverty-stricken rabble—ruined farmers, discharged soldiers, and idlers from all Italy—who lived on state and private charity and on bribes bestowed by office-seekers.

Between the aristocracy of birth and wealth and the vast moneyless mob there was bitter hostility. In vain the Gracchi, grandsons of the great Scipio Africanus who defeated Hannibal

at Zama, came forward as champions of the people and proposed to redistribute the public lands and to limit the powers of the corrupt and selfish Senate. Both fell victims to the hatred of their foes, Tiberius Gracchus in 133 B C, and his brother Gaius 12 years later (See Gracchus).

The death of Tiberius marked the beginning of a century of revolution and civil war, which ended in the downfall of the Roman Republic and the establishment of the Empire. Henceforward armies, not votes, were to determine the course that events would take.

First of the popular military chiefs was

Marius, who had become a national hero by capturing Jugurtha, leader of an insurrection in Africa, and almost destroying (102-101 B C) a horde of German barbarians (the Cimbri and Teutones), who had disastrously defeated four Roman armies one after another. In the year 90 the Italian allies, who had long in vain demanded full Roman citizenship, rose in revolt (the Social War). The struggle lasted two years and ended in the bestowal of the rights demanded.

Rivalry between Marius and Sulla, an adherent of the senatorial party, for command in a war against Mithradates in Asia Minor led Sulla to march with his troops on Rome. For the first time Rome was invaded by a Roman army. As soon as Sulla and his legions were safely

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out of the way in Asia, Marius seized Rome and massacred many of the senatorial leaders

On his victorious return in 82 Sulla took a fearful revenge, slaughtering more than 5,000 of the people's leaders and confiscating their goods. As "perpetual dictator" (81-79) he passed laws transferring supreme power from the people to the Senate, but in vain, the aristocrats were too corrupt and feeble to keep the reins of power.

The history of the remaining years of the Republic is the story of the great adventurers who now made themselves masters of the state, sometimes joining hands to make their position secure, sometimes waging savage civil strife (See Caesar, Pompey).

The only thing that saved the Roman power was the emergence of two statesmen of commanding genius, Gaius Julius Caesar and his great-nephew Augustus (Octavian), who remoulded the tottering structure of the Republic into an empire, in which all power was gradually concentrated in the hands of a single ruler, backed by the might of the Roman legions. How this was done is told in the articles on Julius Caesar and Augustus (See also Cleopatra).

With the establishment of the Empire came two centuries of profound peace, broken only by frontier warfare. At home literature and

civilization flourished, and in the provinces responsible men held power.

More and more the Mediterranean world assumed the aspect of one great nation. Paved roads led from end to end of Italy, and into what are now France and Germany. Fragments of Roman roads still exist even in Britain, aqueducts and bridges in France, and Roman wells in the Egyptian oases of the Sahara. Roman citizenship was given to all free men throughout the Empire, and Roman law was administered in every court.

Christianity Conquers the Empire

In this period of tranquillity the new religion founded by Jesus of Nazareth had an opportunity to grow, until in the reign of Constantine Christianity became the official faith of the Roman Empire.

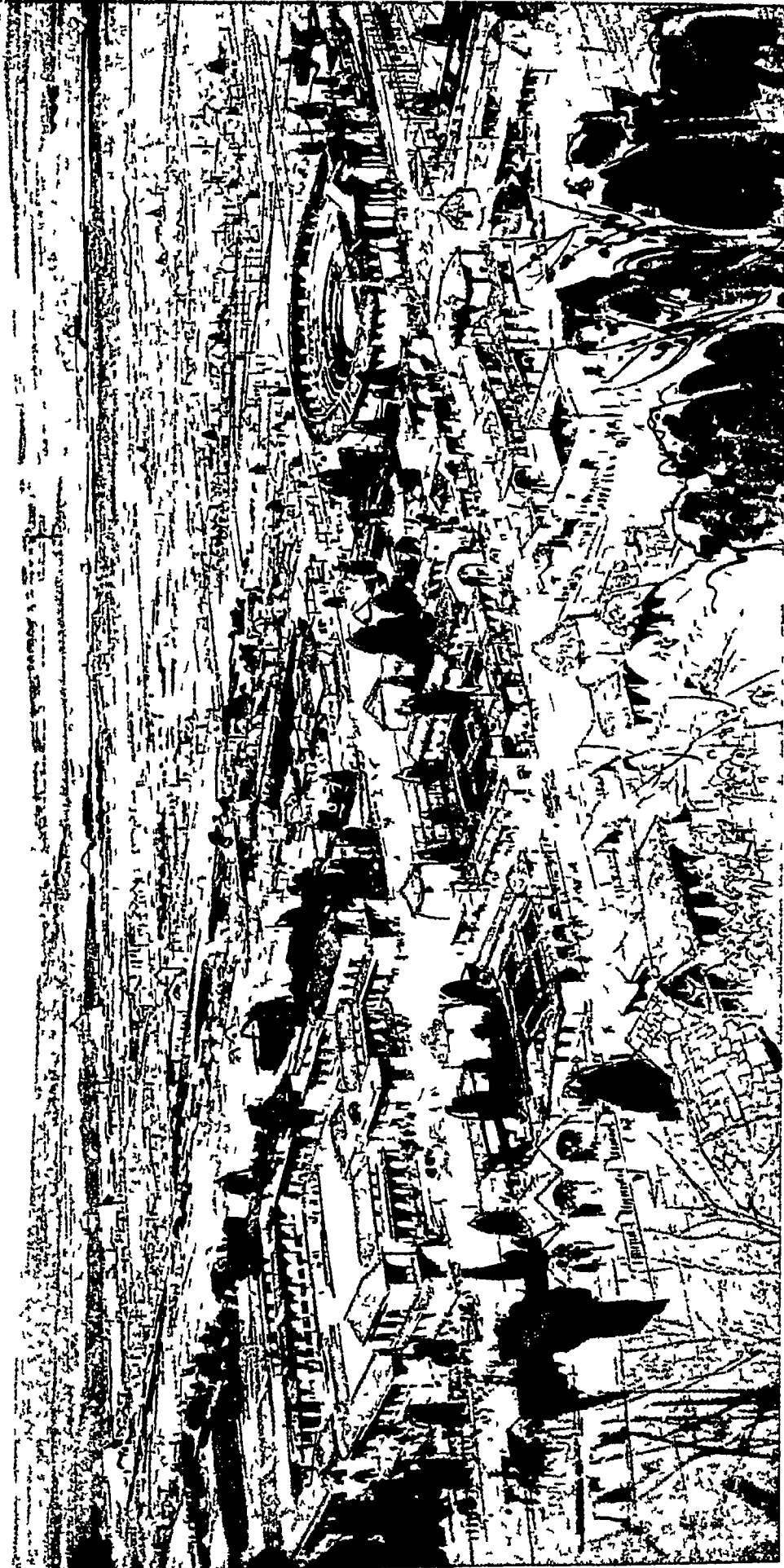
But though the "Roman peace" (*pax Romana*) spread its beneficent influence over the civilized world, though the remotest lands were ransacked to supply the wealthy citizens with luxuries and delicacies, though art and letters were prized and fostered, the national character was steadily decaying. Prosperity had brought in the leaven of corruption. Selfishness had become the first law of life.

The passion for a life of luxurious ease ruled in all classes. The rich amused themselves by



A ROMAN FAMILY DINNER IN THE PERIOD OF DECADENCE

After Rome's conquest of the East, the sturdy simplicity that marked the Roman life of earlier times gave way to Oriental luxury and splendour. The women decked themselves in diamonds, pearls, and rubies from India and robed themselves in silks from China. Peaches, apricots, and other rare delicacies, then appearing for the first time in the Roman world, were brought at immense expense to furnish their tables. And, worst of all, her citizens became degenerate, like the corpulent glutton at the head of this table.



Daily Mail

VERULAMIUM—ROMAN CITY IN ANCIENT BRITAIN

Modern St. Albans is the third of a succession of cities which can be traced from the ancient city of Verulamium, which was, in the time of Caesar, the capital of south-eastern Britain. The sites of the early and later cities of Verulam were excavated from 1930 onwards, and many interesting relics of the ancient Roman settlements were brought to light, including wonderful mosaic pavements and tessellated floors, the remains of large mansions, the main Roman gateway to the city, and a large Roman theatre. Our illustration shows an artist's impression, based on the calculations of Dr R. E. M. Wheeler who directed the excavation work, of what the first big Roman city in Britain looked like.

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giving feasts of unparalleled splendour, the poor had their *panis et circenses*—free bread and free entertainments. Slave labour had degraded the once sturdy peasantry to the status of serfs or beggars. The backbone of the nation, the middle class, had almost disappeared.

After the time of Diocletian the whole Empire was put in leading strings, and under absolute rule society became stagnant politically, industrially, and mentally. Emperors could build up and maintain a bureaucratic organization of great efficiency, but they could not cure the canker at the heart of the people.

Augustus was followed by his stepson Tiberius (reigned A.D. 14–37), a capable but unpopular ruler. Then came the mad Caligula (reigned 37–41), whose life was ended by his own officers after he had reigned only four years. Claudius (reigned 41–54) was not a strong ruler, but his reign left its mark on the history of the Empire for his generals conquered the southern part of Britain. The infamous Nero (reigned 54–68) was the last ruler of the line of Augustus, and his death ended the first century of peace.

For two years there were struggles for the throne between rival military commanders, and civil war was threatened, but with the triumph of Vespasian (reigned 69–79) the

government again became stable. During the reign of Vespasian's son Domitian (81–96), an intolerant tyrant, all Britain was conquered.

Domitian was followed by a line of five great emperors. Nerva's brief reign (96–98) was followed by that of the conqueror Trajan (98–117), under whom the Empire reached its greatest extent. Hadrian (reigned 117–138), first of the "Antonines," consolidated and improved the organization of the Empire and fortified the frontiers, building the great wall across northern Britain, parts of which stand to this day. The period of his wise rule and that of the philosopher emperors, Antoninus Pius (138–161) and Marcus Aurelius (161–180), has been described as the happiest era in the entire course of human history. (See Marcus Aurelius Antoninus)

Rome's Decline Begins

After Marcus Aurelius the decline of the Empire set in. The legions had found that they could make emperors at will from among their own numbers, and they set up 80 such rulers in 90 years. The flood was at length stemmed by Diocletian (reigned 284–305), but at the price of turning the Roman state into an Oriental despotism.

Diocletian also took the first step that ultimately led to the division of the Empire, en-



WHEN ROME WAS MISTRESS OF THE WORLD

As your eye travels along the shaded portions of the map girdling the Mediterranean, it takes in virtually the whole of the ancient civilized world. From the Atlantic to the Caspian, from Britain to the Red Sea, from beyond the Rhine and the Danube to the deserts of Africa, a hundred million souls perhaps, in Europe, Asia, and Africa, were bound together in a far-flung empire such as the world was not to see again until the rise of the British Empire.

trusting an associate with the government of the West, while he himself ruled the East. The decline in the importance of Rome that began with Diocletian was completed when Constantine the Great moved his capital to the Greek city of Byzantium on the Black Sea (A.D. 330), renaming it in his own honour Constantinople (*See Constantinople*).

The transfer of the capital meant ultimately a division of the Empire. The story of the Byzantine Empire is a long and glorious one, that of the Western Empire from this time on one of weakness and decline (*See Byzantine Empire*). Gradually the northern barbarians crept into Italy, and in 410 Alaric took Rome. The Western Empire from that time became the prey of successive waves of barbarians (*See Alaric, Goths, Huns, Vandals*).

In 476 Romulus Augustulus, the last of the imperial line in the West, who combined in

his name that of Rome's legendary founder and that of her first emperor, was deposed by the barbarian leader Odoacer. The Roman Empire was at an end, and the barbarian kingdoms of the Middle Ages were soon to take its place.

But in reading the history of France, Italy, and Spain, you will realize that the end of the Roman Empire was in a way only its beginning. These new kingdoms governed themselves largely by Roman law, spoke forms of Latin, and professed the Christian religion.

Thus, even though the great Empire decayed and fell, Rome had won a new spiritual dominion, for the new faith spread throughout the lands which the Roman power had brought together but could no longer hold, and the seat of the great pagan power became the head of the Christian Church, the spiritual capital of Christendom (*See also Greek Art, Italy, Latin Language and Literature*).

Art's Expression in Ancient Rome

Rome: PAINTING AND SCULPTURE. When Greece fell to the Roman arms she, in art as in many other things, "led her conqueror captive," as one poet has put it. Though there is much in the art of the Romans that reminds us of their predecessors in North Italy, the Etruscans, a glance at the greatest surviving monuments and sculptures of Rome reveals the influence of the Greek masters of centuries before. Yet though the Romans borrowed, they also gave to their borrowings more than a trace of their own practical, dominating spirit.

It was in the 2nd century B.C. that the Roman generals began a systematic plunder of the cities of Greece, bringing back thousands of Greek statues to grace their triumphal processions. Greek artists flocked to Rome to share in the patronage that was so lavishly bestowed, for the wealthy Romans built villas, filled them with works of art, and called for Greek artists or Romans inspired by Greek traditions to paint their walls and decorate their courts with sculptures.

The ruins now laid bare at Pompeii and Herculaneum show us how fond the Romans and their neighbours in Italy were of decorating not only their houses, but the objects of daily use, such as household utensils, furniture, etc.

But with the Romans art was used not so much for the expression of great and noble ideas and emotions as for decoration and show. As art became fashionable, it lost much of its spiritual quality. As they borrowed many elements of their religion from the Greeks, so the Romans copied the statues of Greek gods and goddesses. The Romans were lacking in great imagination. Even in one of the few ideal types which they originated, the "Antinous,"

the Greek stamp is unmistakable. In one respect, however, the Roman sculptors did show originality; they produced many vigorous realistic portrait statues. Among those that have come down to us are a beautiful bust of the young Augustus, a splendid full-length statue of the same emperor (*see page 348*), and busts of other emperors and famous men. All these have an historic as well as an artistic value. So, too, have the reliefs which adorn such structures as the Arch of Titus and the Column of Trajan, commemorating great events in these emperors' reigns.

The Vanished Paintings of the Past

In painting—though here, too, they learned from the Greeks—it seems probable that the Romans developed more originality than in sculpture. Unfortunately the great masterpieces of the earliest paintings no longer exist, but we can learn much from the mural paintings found in the houses at Pompeii, Herculaneum, and at Rome. The pleasing colouring, which in many of these paintings still remains fresh and vivid, seems to indicate that even from these ancient days Italy was the home of painters of great talent. Portrait painting especially flourished at Rome, where street-corner artists became so common that one could have one's portrait painted for a very moderate sum. These portraits were more remarkable for their realistic than their artistic merit, as we know from several surviving examples.

Although the art of Rome loses in comparison with that of Greece, still it commands our admiration, and we owe the Romans a debt of gratitude for helping to transmit to us the art of the Greeks, who were their great masters (*See also the article on Greek Art*).

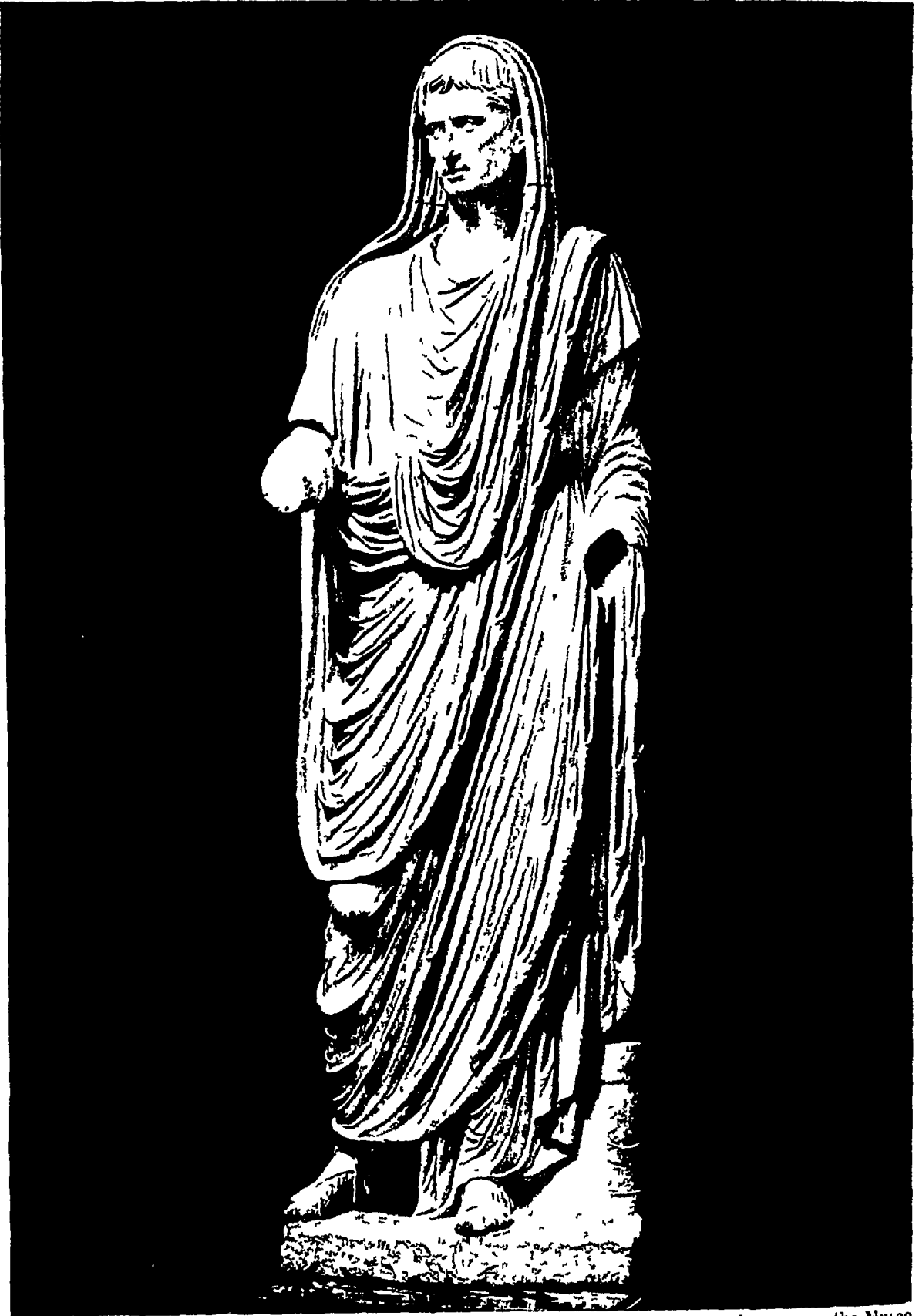
ENDURING WORKS OF ROMAN GENIUS



In the Piazza del Campidoglio on the Capitoline Hill in Rome stands this fine equestrian statue of Marcus Aurelius emperor from A.D. 161 to 180 and author of the famous *Meditations*. Today the balance of the statue is spoiled on account of the loss of the barbarian figure which once crouched beneath the right fore hoof of the horse. Nevertheless it is a good example of the art of the Antonine Period so called from the Emperor Antoninus Pius (A.D. 86-161) when idealized figures were displacing the realistic statuary of Trajan's reign.

Photo Anderson

PORTRAIT STATUE OF FIRST ROMAN EMPEROR



This fine statue was found during excavations in the Via Labricana, Rome, in 1909 and is now in the Museo Nazionale delle Terme in that city. It represents the Emperor Augustus (reigned 27 B.C. - A.D. 14) as *pontifex maximus*, or chief administrator of religious law. He is heavily draped with veiled head, and is shown in the act of making a sacrifice. The nobility and poetic quality of the head are admirable, and the classical Greek style is here combined with the more natural qualities of the Etruscan school.

Photo Anderson

PRAETORIAN GUARDS IN THEIR PARADE ATTIRE



In the civil wars of the first century B.C. the rival commanders each had his guard of picked veterans. Under the Empire the number of praetorian cohorts varied from nine to sixteen, commanded by a praefectus praetorio, and these guards chose and deposed many of the emperors. Much of our knowledge concerning the dress and equipment of the ancient Roman legions has been derived from antique frescoes and reliefs, such as that above, which is now in the Louvre Museum in Paris. In the background is the imperial eagle.

Photo Giraudon

LONG-DEAD ROMANS WHO STILL LIVE IN ART



Here are four examples of the portrait sculpture of ancient Rome. Top left is a head of Antinous (died A.D. 122), the favourite of Hadrian, now in the Salle de Sévère at the Louvre Museum, Paris. Top right is a finely modelled head of Octavia, sister of Augustus and wife of Mark Antony, in the Louvre Museum, Paris. At the bottom left is a bust of the Emperor Caracalla (A.D. 188-217) in the Berlin Museum. Bottom right is the Emperor Augustus as a youth, in the Vatican Museum; the portrait is delicately modelled but still individual.

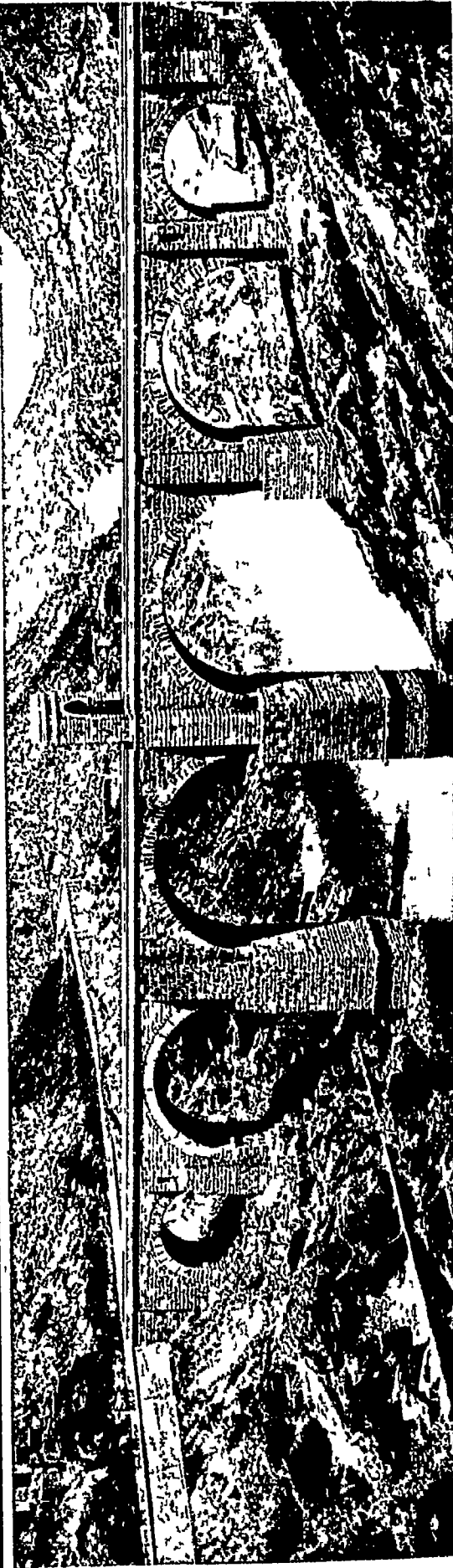
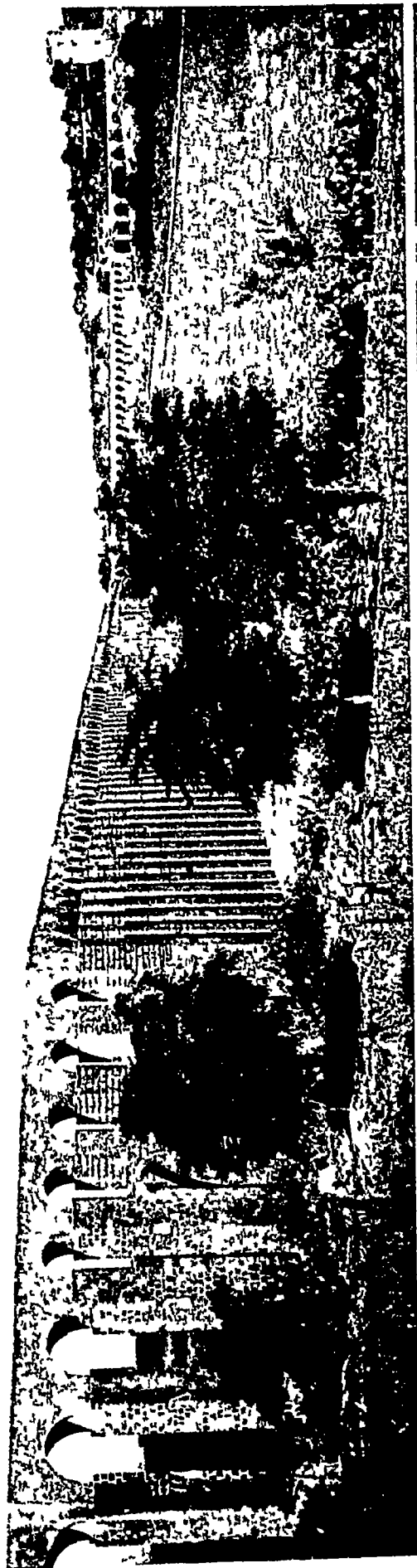
Photos: top left Altieri; top right Giraudon; bottom left Bruckmann; bottom right Anderson.

POMPEIAN PAINTING RECOVERED FROM THE ASHES



Though painting was as popular with the ancient Romans as sculpture we have fewer examples of their art in this medium owing to its more destructible nature. For our knowledge of Roman painting in general we are chiefly indebted to the excavations at Pompeii though as Pompeii was a centre of Greek rather than Roman civilization the paintings found there show decided Greek influence. Here is a fresco from Pompeii depicting the mythological story of Europa and the Bull. It is now in the National Museum at Naples.

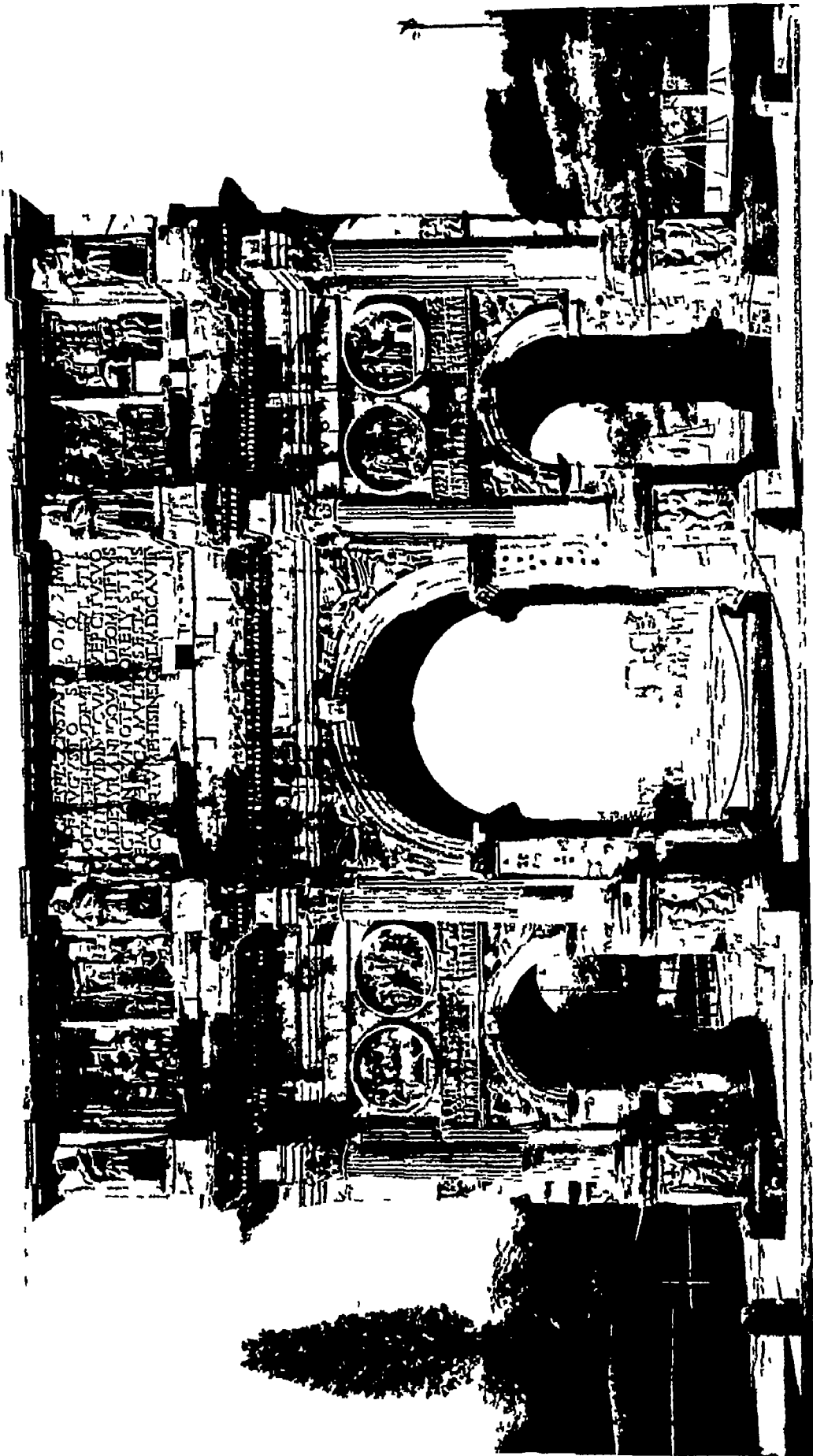
Photo taken on



HOW THE ROMANS CARRIED ROADS AND WATER ACROSS DEEP GORGE AND WIDE VALLEY

Alcantara in western Spain owes its name (in Arabic the bridge) to the tunc bridge, seen in the lower photograph, which spans the Tagus Built about A.D. 105, in honour of the Emperor Trajan this bridge is over six hundred feet long and nearly two hundred feet high Many of the Roman bridges can still bear the traffic of today and this is a case in point. Similarly some of the ancient Roman aqueducts are used to this day In the upper photograph is seen the aqueduct that brought water to Roman Carthage from the mountains of Tunis, built by the Emperor Hadrian (reigned A.D. 117-138) it is 60 miles long

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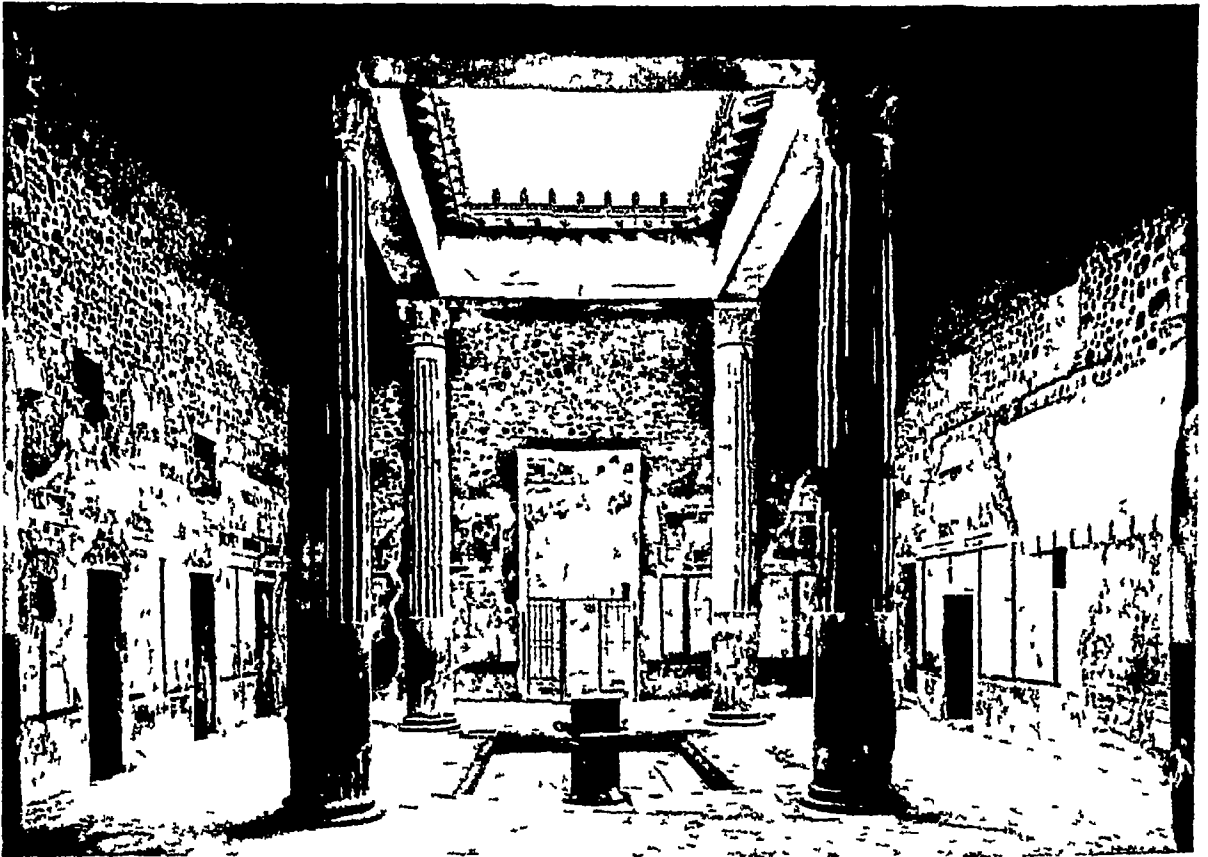


CONSTANTINE'S MEMORIAL—BEST-PRESERVED OF ROME'S TRIUMPHAL ARCHES

West of the Colosseum and at the northern end of the new Via dei Trionfi, in Rome stands this magnificent archway of marble richly sculptured. It was erected in A.D. 315 to commemorate the victory of Constantine over Maxentius. At both sides of the arches are Corinthian columns of Numidian marble each surmounted by the figure of a Dacian. Between the figures above the smaller arches are reliefs showing scenes from the life of Marcus Aurelius while those in the medallions below depict episodes in the life of Constantine. Above the central archway is seen the dedication to the Emperor Constantine

Photo Anderson

IN ONE OF OLD POMPEII'S STATELY MANSIONS



The gradual uncovering of the buried city of Pompeii, overwhelmed by the great eruption of Vesuvius in A.D. 79 has enabled us to form a perfect picture of the domestic life of the time. Many of the houses which have been excavated are in a remarkable state of preservation, and our photographs show one such mansion called the House of the Silver Wedding. The upper photograph shows the gardens and peristyle while the lower photo is of the central hall, with an opening in the centre through which rain fell into the basin below.

Photos Anderson

ROMEO

'Romeo and Juliet.' In this romantic Shakespearian tragedy, old Capulet, head of a noble house of Verona, Italy, invites his friends and kinsmen to a masque in honour of his beautiful only child, Juliet, whereat it is his hope she may be betrothed to the rich Count Paris. Young Romeo, of the house of Montague, whose ancient feud with the Capulets has filled the city streets with many brawls and duels, disguises himself and dances with the guests. No sooner does he set eyes on Juliet than the pair fall irrevocably in love. They are secretly wedded by their father confessor, Friar Laurence, but before the wedding day is over Romeo is provoked into slaying a Capulet and is banished from Verona.

Old Capulet now commands Juliet to prepare for immediate marriage with Count Paris. To save herself, she swallows a drug given her by Friar Laurence, and is thrown into a death-like trance until word can be sent to Romeo to come and bear her away with him. But Romeo hears that she is dead. Frantic, he arrives at Verona, breaks into the tomb where Juliet lies, and there poisons himself.

Waking from her trance and discovering the sad failure of her plan, Juliet stabs herself with Romeo's dagger and dies upon his body. Thus the children of the Capulet and the Montague become "poor sacrifices of their enmity," and by their death heal the feud.

One of the most enchanting scenes in literature is found in this play—the famous balcony scene in the garden of the Capulets, where Juliet is wooed by Romeo and in return discovers her love for him. The whole is written in language of purest passion and poetry.

Romulus and Remus. The Romans were very proud of their origin, for they believed that the father of Romulus, the mythical founder of Rome, was Mars. His mother, Rhea Silvia, the daughter of King Numitor of Alba Longa, was said to be descended from the great Trojan hero Aeneas, a son of the goddess Venus. According to the legend, a brother of King Numitor usurped the throne and then ordered Romulus and his twin brother Remus to be thrown into the river Tiber. They were miracu-

lously saved, however, and were nursed and cared for by a she-wolf, until discovered by a shepherd who brought them up in his home.

When the brothers grew up, they decided to found a city on the banks of the Tiber, but in a quarrel which arose over the naming of the city Remus was slain. Romulus then built the city, which was called after his name, and invited all outcasts and fugitives, so that it grew very rapidly. After having firmly established his city and made peace with the neighbouring people, Romulus (so the old legend continues) was caught up to heaven. Afterwards he was worshipped by the Romans as Quirinus.

Rook. To the countryman one of the pleasantest of all sounds is the "caw-caw" of the rooks as they sit about the tall trees in which they have made their colonial home, the rookery. There is something particularly cheerful and homely about the sound, and also about the birds that make it.

Glossy blue-black all over, except for a naked, whitish patch round the beak, the rook is a large bird, and on the ground is easily recognizable by the way in which he walks about, with a stately, solemn tread, as if he were being very careful to keep his dignity. He is generally a useful bird, devouring vast numbers of harmful grubs and insects on the farm, as well as seeds, only occasionally, under certain conditions, does he take to grain. Too many rooks, however, may be a nuisance, and for that reason the farmer shoots a fair number of young birds towards the end of the breeding season.

When there is ploughing, the rooks gather round in great numbers, together with the jackdaws and the gulls that have come inland, for the feast of grubs turned up by the gleaming share as the ploughman goes along. Though they roost in their rookery, these birds have a little daily "migration" of their own, for in early morning they fly down to the feeding-place and they usually stay there until late evening, when they fly home, cawing all the way.

One of the most important signs of spring is the collection of twigs, green as well as dead, made by these birds as they start their nest-building operations in March. Sometimes the



ROMEO AND JULIET

This drawing, by Sir Frank Dicksee, P.R.A., admirably illustrates Shakespeare's lines "Good-night, good night! Parting is such sweet sorrow That I shall say good night till it be morrow."



A ROOK ON THE WING

The big, blue-black rook is one of our most familiar birds, easy to recognize even when on the wing. Observe his strong beak, and how the wing-feathers are separated as he glides down, above the tree-tops.
Photo Arthur Brook

old nests are pulled to bits, sometimes they are rebuilt, and it must be admitted that a good deal of sly thieving goes on between neighbours. The nests are lined with fine roots, hairs, or even pieces of paper, and in them are laid the eggs, usually three or four in number, brown-spotted on a blue-green background. The rookery is always built in safe trees, and when rooks suddenly desert one of their traditional country homes, it is nearly always a sign that the trees are getting old and unsafe.

Other members of the rook tribe are the jackdaw, raven, and the crows—all of which are dealt with separately in this work.

Roosevelt, FRANKLIN DELANO (Pron rō'-ze-velt) (Born 1882) It is hard to believe that at the age of forty the energetic President of the United States, Franklin

Roosevelt, was crippled in arms and legs by infantile paralysis. The persevering manner in which he enforced his "New Deal" is a reflection of the persistence with which he patiently exercised his almost helpless limbs back to life.

A lawyer by profession, Roosevelt was elected to the New York State Senate in 1910—the year following the end of the Presidential term of Theodore Roosevelt, his distant cousin. In 1913 he was appointed by President Wilson Assistant Secretary of the Navy, and throughout the World War he displayed tremendous energy in organizing the American Navy. Then in 1921 he was stricken with infantile paralysis, but, undaunted, he returned to the political field in 1924. He became Governor of New York four years later, and in 1932 was elected President.

In a speech during his electoral campaign for the Presidency, Roosevelt said, "I pledge you—I pledge myself—to a new deal for the American people." Not since the day when Abraham Lincoln took office had any President faced so critical a situation. America, after a spell of great prosperity, had been caught in the world slump. Business was slowing down to a standstill, accompanied by a banking panic. Action by the government seemed imperative to save the nation from complete economic collapse. The whole world was watching the new President.

The leading features of Roosevelt's "New Deal" were to provide direct relief for the unemployed, to make individual property and the banking system secure, and to establish a planned and controlled economic system by "putting the government into partnership."



Keystone

FRANKLIN D. ROOSEVELT

It hardly looks as though this United States President would be allowed to finish his work before he was dragged away to play with his grandchildren! This delightfully intimate study was taken in President Roosevelt's home at Hyde Park, New York. No doubt the President was glad of a pause in the day's occupation to put away for a few moments the cares of State.

ROOSEVELT

with industry, agriculture, housing, and transport. The New Deal programme at first met with widespread popular approval, millions of people in all walks of life enthusiastically believed that it would soon solve the nation's troubles. But in 1934, when industry appeared to be recovering, labour troubles and strikes became more frequent, and, on the other hand, there were many who urged that, now that the worst of the crisis was over, the time had come to revert to the old ways of the days before the slump. But Roosevelt held that a return to the old system could lead only to the alternation of booms and depressions, and that industry must be regulated by the State in order that these, with their widespread dislocations and universal distress, might be avoided.

In 1936 he was re-elected to the Presidency in the most sweeping victory since the election of Monroe in 1820. In his inaugural address he dedicated his second administration to achieving "a greater satisfaction in life for the common man". The following year he proposed a sweeping reorganization of the executive departments and the Federal judicial system, which in his opinion were quite out of date in the modern world. Then he took steps to re-enforce the measures of the New Deal with renewed strength, convinced that only in the complete success of his programme could the American people be assured of a reasonably happy and secure future.

Roosevelt, THEODORE (1858-1919) By a strange chance the two most vigorous American Presidents of the present century have both borne the name of Roosevelt.

Theodore Roosevelt, who was President of the USA from 1902 to 1909, came of a rich family and his education was that of most other young men of his class. On leaving college he began to study law, but his real bent was for politics and at the age of 23 he became a member of the New York State Legislature. Domestic bereavement and political rebuffs turned him away from politics for a time but after three years as a rancher he re-entered public life,

first as Civil Service Commissioner, 1889-1895, and then as New York City Police Commissioner, 1895-1897. During his term of office in the latter post he did his utmost to free the police force from political influences. In 1897 President McKinley, recognizing his ability, made him Assistant Secretary of the Navy, but when war with Spain broke out Roosevelt resigned and formed a volunteer cavalry regiment of Rough Riders which under his command did distinguished service in Cuba.

Roosevelt came home as a national hero and was elected Governor of New York. In that office he conducted a campaign against political corruption which so disturbed his party that they nominated him to the powerless position of Vice President of the USA in the hope of stopping his reforming zeal. But fate intervened to prevent the shelving of Roosevelt, for in September, 1901, President McKinley was assassinated and Roosevelt, according to the Constitution, succeeded him as President without having to seek election.

The new President immediately began a campaign against trusts and the alliance of political machinery with great industrial projects which he thought were contrary to the public good. In 1904, when President McKinley's term of office would have expired, Roosevelt had to seek re-election and he was returned by a great

majority. During his second term of office he took an active part in the negotiations which ended the Russo-Japanese war in 1905, and for this was awarded the Nobel Peace Prize in 1906. After his Presidency Roosevelt spent some years in exploring and hunting expeditions in Africa and South America. In 1912 he was once more a candidate for the Presidency, but was defeated. He died on January 6, 1919.

Root. The root is far more important to the plant than you might at first think, for it not only has to anchor and support the plant, but also to absorb water and minerals from the soil. A plant possesses a "tap root" system when it has one stout prominent root extending for some distance into the soil. The "fibrous-root"



THEODORE ROOSEVELT

Rancher, soldier, explorer, writer, and President of the United States, Theodore Roosevelt lived a life crowded with adventure. His favourite expression was "speak softly and carry a big stick", one of his greatest achievements was to make possible the building of the Panama canal.

HOW THE FIBRE GETS TO THE SPINNING FACTORY



When you walk away from a shop with a little ball of manila twine in your hand, you little realize that you are giving that twine its last lift on a journey that has covered thousands of miles, over land and sea. Before any man touched it, it was a part of the manila plant (1), which is a native of the Philippine Islands. Until recent years practically all twine was made of manila, but now Mexican sisal, being cheaper, is also used widely. The manila plant is cut down by a brown-skinned little Filipino, who uses only primitive tools, perhaps a hatchet, but sometimes only a sharp stone or a forked stick (2). Another Filipino breaks the stalk into layers or strips (3), after which it journeys to some warehouse where it is carefully examined and sorted (4) before being shipped elsewhere for manufacture into twine. Arrived at the factory, the fibre is first softened and combed (5) into long ribbons called "slivers." These usually go through a second combing or drawing (6), and sometimes more, depending on the grade of fibre and the desired quality of the finished twine.



system is very different, with slender roots, much branched, as in the bean, etc. Many trees have a number of large roots spreading equally on all sides, close under the surface, and this in general is the best system for anchorage against winds from all directions. Thickened or fleshy roots developed in clusters, as in the dahlia, are called "fascicled" roots. A "rhizome" is a storage root from which stems arise each year, while a "tuber" is another type of root swelling which produces a new plant when the rest of the root system has died.

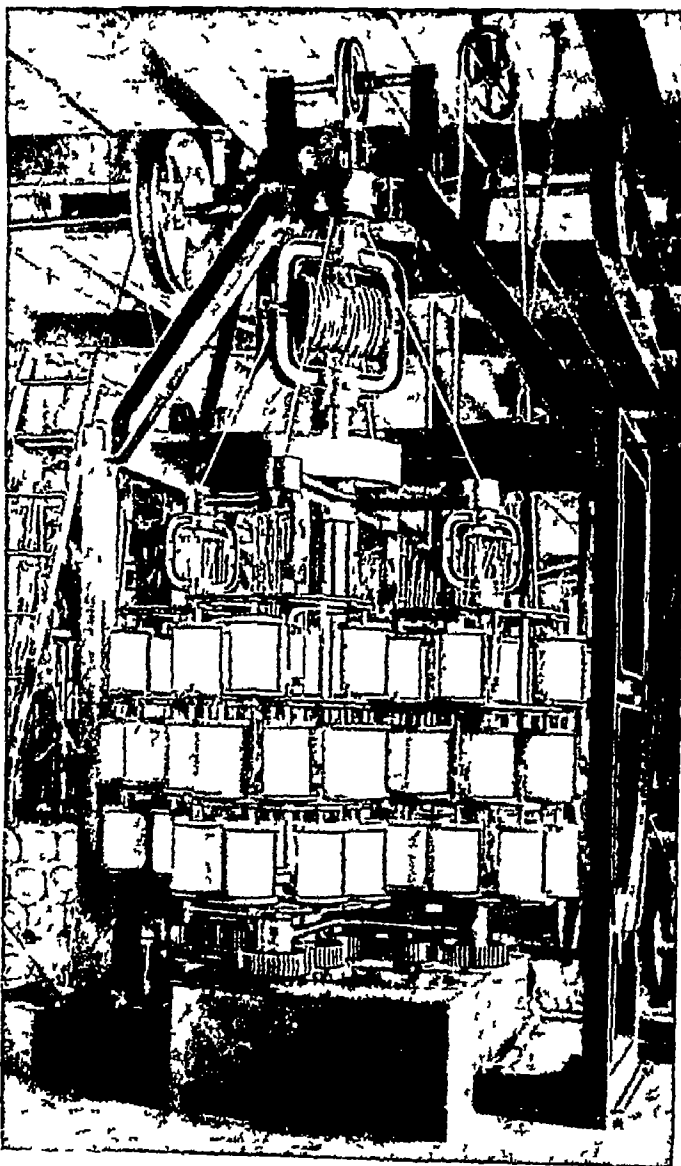
Root's Cap and Hairs

Each root is generally capped by a blunt root cap of firm cells, which protect the delicate growing tip. Behind this cap are usually many slender root-hairs, which are devoted to the absorption of liquid foods and are constantly dying off and being renewed. The water and dissolved minerals taken up with it by the roots are essential to the building of the plant cells, but by far the largest proportion of the plant's food is derived from the carbon dioxide absorbed by the process of photosynthesis by the leaves. (See Leaves)

The force exerted by growing roots is remarkable. In rocky places it is a common thing to see small crevices in the rock where quite slender roots enter and split the rock apart as they grow. (See Plant Life)

Rope and Twine Man's earliest cords or lines for fishing, tying animals, etc., were mere fibrous roots, strips of bark, or hide thongs, such as certain savage tribes still use. Ancient Egyptian inscriptions are believed to portray a form of rope making.

Prior to 1792 rope was made entirely by hand, and in some places there still exist the long, narrow sheds or alleys—



SPINNING THE FIBRE INTO TWINE

When the manila fibres have been properly drawn and combed (see opposite page) they journey to the spinning room (top), where they are twisted right-handed into yarns, wound on large bobbins. The lower photograph shows the last processes of laying and forming the strand. At the top is one of the large bobbins, below that the revolving flyers which spin the strands together into twine, and finally, at the bottom, the spools of finished twine.

"rope-walks"—in which this work was done. Then came machines for twisting hand-spun yarns into rope strands, and later a yarn-spinning mechanism was developed. About the middle of the 19th century steam-driven machines were introduced for making not only all cordage an inch or more in circumference—which goes by the general name of rope—but also all smaller cordage, which we know as string, cord, or twine.

Cordage is made of various kinds of hemp, or fibres known under the name of hemp, especially manila and its cheaper rival, sisal (*See Hemp*). Other materials used are flax, cotton, jute, and cor, the casing or bark of the coconut.

The raw material arrives at the rope factory in great bales. It is loosened, spread in layers, sprinkled with oil, and then "hackled" or mechanically combed to clean and straighten the fibres. The fibres are twined and twisted end to end into one continuous ribbon or *sliver*, and the slivers are passed on to the spinning machines. These twist the fibre into yarns, which are mechanically wound on to huge bobbins.

From the bobbins the yarns are fed to the strand-forming machine through holes in an iron plate, so placed that the yarns all converge into a tube, where they are compressed into a bundle and twisted into strands by the revolutions of a long carriage. The strands again pass through openings and converge in a central tube, through which they pass to a second set of revolving flyers, and these twist the strands into rope.

Thus rope making is a series of twisting processes. Each twist is in a direction opposite to that of the preceding twist, so as to make the finished product tight and hard. Ropes are twisted together in order to form a larger rope, a hawser, a cable, etc.

The cordage is frequently covered with tar (by means of copper troughs and pressing rollers) to protect it from the effects of moisture. But

hemp ropes have been largely superseded in many industries by powerful wire cables made of copper, iron, or steel wires.

Roscommon, COUNTY OF EIRE Roscommon is one of the inland agricultural counties of Eire. The principal lakes in the county—Lough Allen, Lough Boderg, and Lough Ree—together with the river Shannon, form the whole eastern boundary of the county, and the

river Suck, a tributary of the Shannon, forms most of the western. The only other large river is the Boyle, on which stands a town of the same name. This is the largest town of the county (pop., 2,300). Roscommon is the county town (1,800), and Elphin (800) is the only other important town in the county.

All Roscommon is rather low-lying, and it contains some extensive bogs. Agriculture is the chief occupation. The area of the county is 990 square miles, and its population 77,400.

Rose. From early times roses have not only been favourite flowers, but also the beauty of their scent and their appearance has led them to be used for the most extravagant purposes. The ancient Romans, for example, used quantities of them, stuffing couches as well



LOVELY SPRAY OF WILD ROSES

The wild roses of the wayside do more than anything to make our countryside gay in early summer, and here is a beautiful spray with several fine blooms. These are single roses, as you see, with only one series of petals—not double, like the cultivated ones shown in the opposite page.

as covering them with rose petals, scattering them in palace halls, and, on festive occasions, even in the streets. In Persia and in all other places where the rose found its way, love and honour awaited it. And throughout the Middle Ages ran a thread of rose-romance, for this was the flower of chivalry, as well as the badge of the two great English families whose feudal combats were known as the Wars of the Roses, and the emblem of England herself. By reason of its fragrance and its beauty, and because it is capable of producing so many and unusual varieties, the rose is always popular.

The rose, too, is the source of rose-water and the precious attar of roses, an oil of great fragrance. It requires 40,000 flowers to make a single ounce of attar. In the south of France

ROSE

roses are grown for this purpose, as they are in thousands of acres in Bulgaria, where a fine quality of rose attar is obtained

Roses comprise the genus *Rosa* of the family *Rosaceae*. In temperate and cold parts of the Northern Hemisphere they are widely distributed, usually as erect, climbing, or trailing shrubs, generally prickly-stemmed, with flowers borne either singly or in terminal clusters. The flowers are followed by a berry-like fruit, generally red or orange-yellow—the “haws” of the autumn hedges.

There are thousands of varieties. Among important groups of these are the moss-rose, rambler, tea, hybrid tea, monthly, and hybrid perpetuals.

There are many species of wild roses, ranging in colour from white to pink or red. They all have single blossoms with five petals, and numerous stamens and pistils. In the many-petalled cultivated varieties these stamens are transformed into petals. British wild roses include the common wayside dog rose (*R. canina*), the field rose (*R. arvensis*), with thin, straggling stems and large flowers, the little burnet rose (*R. spinosissima*), found on dry heaths, with very spiny, upright stems and white flowers, and the sweet brier (*R. rubiginosa*), whose leaves smell so fragrantly when they are crushed.



Roses, WARS OF THE This name originated in the fact that the House of Lancaster, which claimed the throne of England from the House of York, used the red rose as their emblem, while the badge of York was the white rose.

The great House of Lancaster and the rival House of York were each descended from Edward III. Henry VI, the head of the Lancastrian house, represented the third line of descent from Edward III, while Richard of York was descended through his mother from Edward's second son and through his father from the fourth son.

By strict rules of inheritance the Yorkists had a better claim to the throne than the Lancastrians, but they had been passed over in 1399, when Richard II was deposed, and would have won no attention to their claims later but for the failure of the English armies in the Hundred Years' War (qv) and for the misrule at home.

At first Richard of York aimed merely at taking the government from incapable persons and securing it for himself, but later his object was to seize the crown. On the Lancastrian side the real head of the party was Queen Margaret, a young and beautiful Frenchwoman, wife of Henry VI, and mother of Prince Edward.

The struggle began in 1455 with the battle of St Albans, in which York was victorious.



SOME FAVOURITE TYPES OF ROSE GROWN IN OUR GARDENS

One of the reasons for the popularity of roses is surely their endless variety, as exhibited in these three photographs. At the top is the old favourite, “Hugh Dickson,” a rich, deep crimson-scarlet variety, to the left is a lovely white moss rose, one of the old-fashioned sorts and so called because of the moss-like covering of soft spines on its shoots. To the right is a fine pergola covered with three different sorts of climbing roses from left to right, “Excelsa,” “Lady Godiva,” and “Hiawatha.”

Photos top courtesy of “Amateur Gardening” bottom right R. A. Maibou



CHOOSING THE ROSES

The painting by John Pettie reproduced above illustrates the scene in the Temple garden, described by Shakespeare in *King Henry VI*, Part 1, when Richard of York and the Earl of Somerset chose white and red roses, respectively, as the emblems of their rival factions of York and Lancaster

and got control of the government. Four years later the contest was renewed, and after varying fortunes York was defeated and slain in battle by the forces of Margaret at Wakefield (1460). But his strong and able son, Edward IV, obtained the throne, by the Earl of Warwick's help, while poor mad Henry VI was kept a prisoner in the Tower of London.

Then Warwick, the "King-maker," as he was called, quarrelled with Edward, and helped Margaret to drive Edward IV from England and restore Henry VI (1470). But next year Edward returned, Warwick was defeated and slain in battle, the young Lancastrian prince was captured, and murdered at Tewkesbury (1471), and Henry VI was assassinated in the Tower on the very day that Edward IV re-entered London.

This ended the struggle, but it was renewed twelve years later, when Henry Tudor, the last Lancastrian representative, defeated and slew the last Yorkist king, Richard III, at Bosworth, (qv), and won the throne for himself. Henry married Elizabeth of York, daughter of Edward IV, and the white and the red rose were united in the rose of the Tudors, the emblem of a new line of English kings. (See also *Henry, Kings of England*, *Richard, Kings of England*)

Rosetta Stone. One of the first things most people notice in the British Museum in London is a big black stone inscribed with a number of strange looking signs. This is the Rosetta Stone, one of the most important "documents" in the world.

It gets its name from the fact that it was discovered at Rosetta, an old city in the Nile delta. This was in 1799, during Napoleon's occupation of Egypt, and its discoverer was one of his officers. Two years later it was acquired by Britain when Alexandria surrendered to British troops, and it reached the British Museum in 1802.

But why is it so important? Because the inscription upon it—a priestly decree written in 196 B C—is in three scripts: Greek, demotic (the popular form of writing used in ancient Egypt) and ancient Egyptian hieroglyphics. Now up to the time of its discovery no one had succeeded in reading the hieroglyphics with which the Egyptian temples and tombs are so lavishly inscribed. Many scholars for hundreds of years had tried to decipher the strange characters, but with no success. It was the Rosetta Stone which provided the first real clue to the puzzle.

The Greek inscription was, of course, easily translated, the demotic, too, was partly deciphered. Then an English scholar, Thomas Young (1773-1829), by comparing the hieroglyphic inscription with the Greek, made out the word "Ptolemy." Finally, a great French savant, J. F. Champollion, completed the decipherment of the inscription.

So it was that this block of black basalt enabled scholars to read at last the inscriptions that had mystified them so long, and so, through the discovery of that French officer, we may now understand much about the ways and thoughts of the Egyptians who lived thousands of years ago. (See illus. page 1412)

Ross and Cromarty, SCOTTISH CO. Situated in the north of Scotland, and including part of Lewis and some of the smaller Hebrides, this county covers an area of 3,089 square miles. The coast-line is deeply indented with firths and sea-lochs.

The surface is mostly very high and mountainous, and deer, alpine hares, foxes and game birds abound. There are about 800,000 acres of deer forest. Occasionally golden eagles, ospreys, wild cats and badgers are seen. Salmon and trout are plentiful. Great live-stock markets are held at Muir of Ord. The east coast is the most fertile part of the county. Oats is the

most widely-grown grain crop, and barley and wheat are also cultivated

The loftiest peak is Carn Eige (3,877 feet), and many others exceed 3,000 feet. The Orrin is the chief river. Loch Maree is the largest and loveliest of the numerous freshwater lakes. Dingwall (population, 2,554) is the county town. Holiday resorts include Ullapool, Gairloch, and Strathpeffer. Invergordon was a naval base during the World War.

Formerly a part of the great province of Moray, the modern county had its origin in the earldoms of Ross and Cromarty. Out of these the county of Ross was formed in 1661, and that of Cromarty in 1685 and 1698, and in 1889 the two were united into one county. The county's population is 62,800.

Rothschild. For most of the 19th century the House of Rothschild, a Jewish family of bankers, ruled the money markets of Europe. It was from the Rothschilds that all the great nations borrowed money.

Mayer Amschel Rothschild (c 1743–1812) laid the foundation of the family fortunes. He was born in the ghetto (Jewish quarter) of Frankfort-on-the-Main, in Germany. There he set up in business as a money lender, as had many generations of Rothschilds. An expert in rare coins, Mayer Amschel gained access to homes of the rich, notably to that of the Elector William of Hesse-Cassel. Soon he was entrusted with some of the Elector's important affairs. Meanwhile he trained his five sons to work as a team for the profit of the wide spread Rothschild family.

The Rothschilds owed their rise as international bankers largely to the Napoleonic wars. Mayer Amschel's third son, Nathan (1777–1836), who had gone to England about 1800, ran goods through Napoleon's blockade at great profit. He also devised and carried out, with his brother's help, a clever plan to get gold through France to finance Wellington's army in Spain. This led to a post for Nathan as agent of the British Treasury, and at the close of the war the House of Rothschild was commissioned to handle loans to France and Austria. The other brothers were in charge of banks in Paris, Vienna, Naples and Frankfort.

Under the five brothers and their descendants the House of Rothschild flourished exceedingly. They financed European wars and railways in Europe and in America, and also participated in loans to the United States. Nathan's son Lionel (1808–1879) in 1875 lent the money with which Disraeli bought control of the Suez Canal. Lionel was the first professing Jew to be elected to Parliament, and his son Nathan Mayer (1840–1915) was the first Lord Rothschild. In the 20th century Rothschild power in world affairs has tended to decline, but there are still powerful Rothschild banks in London and Paris.

Rotterdam, HOLLAND. Rotterdam means the "dam or dyke of the river Rotte." The Rotte is a little river which runs into the Maas or Meuse, on the shores of which the city is built and the dyke stands where the two rivers meet.

Rotterdam is the second largest city in the Netherlands, and the most important commercial port. Although it is about 15 miles from the sea, the river is so deep and the tide runs so high that some of the largest vessels can dock there. There is a canal from Rotterdam to the North Sea at the Hook of Holland.

Rotterdam's chief business is trading by sea in coffee, tea, tobacco, flour, sugar, spices, coal,



TOWN HALL OF ROTTERDAM

M. O. Henchao

Rotterdam is the main port of Holland, and from its docks great liners sail to the Dutch colonies, to America and to Africa. Unlike many ports, but like most Dutch towns it is clean and dignified, and the photograph above shows one of the fine streets of the city with the stately town hall.

oil, and all sorts of foodstuffs, especially with the Dutch East Indies. Rotterdam is also the centre for the Rhine-Meuse water-borne inland traffic. Shipbuilding is the leading industry.

Most of the quaint, old-fashioned wooden houses with their many gables are built on piles. A number of tree-bordered canals and waterways run through the city in all directions. The principal quay is called the Boompjes, or "little trees." One of Rotterdam's most cherished treasures is a statue of the great Erasmus, who was born either at Rotterdam or at Gouda. Rotterdam probably originated in two castles which existed there in feudal times. Population before German invasion in May 1940 about 600,000.

Round Table. When King Arthur of Britain gathered about him his chosen knights, according to the legends they sat at the famous Round Table, so that there might be no quarrels as to who should sit above the other, and that the king might sit among them, a man among equals. The name came to be used as the title of this mythical order of chivalry.

According to some versions, the table was made by the wise magician Merlin, and it came into Arthur's possession with the dowry of his queen, Guinevere. The legends differ as to the number of knights, some placing the figure at 150, and others making the number that the table could seat much larger.

Only the best and most valiant knights were adjudged worthy of a seat at the Round Table, and each chosen knight had his own seat with his name carved upon it. The members formed a brotherhood bound by oath to help one another in danger and to refrain from fighting among themselves.

There was one seat, however, known as "the Siege (seat) Perilous," which had no name upon it. It was reserved for him who should succeed in the search for the Holy Grail—that mystic vessel from which Christ had drunk at the Last Supper. It was filled at last by Sir Galahad, the perfect knight.

Tennyson tells many of the stories of the Round Table in his "Idylls of the King" (See Arthur, King, Galahad).

Brave Tales of the Round Table



The Ninth Diamond

KING Arthur's herald ran from the assembly hall to the marble steps that led to the palace gardens. There he blew a fanfare on his silver bugle to call the lords and ladies of the court.

"Prepare for the tournament!" he announced. "The knights of King Arthur's court will engage in friendly contests with all who come to the jousts. The last and largest of the nine diamonds goes to the victor."

Mounting his horse, he galloped away to spread the news throughout the realm. By inviting untried youths of noble birth to enter the lists in the annual tournament held at

Camelot, King Arthur won recruits to his order of knighthood. The knights yawned, and strolled away to idle games with the ladies. "What is the use of that contest of arms?" they said. "For eight years Sir Lancelot has been the victor, and won the prize. He will win the ninth diamond."

Now Sir Lancelot, sitting with Queen Guinevere in her bower, overheard this and reported it to the king.

"Sire," he said, "because I have held the championship for eight years, your other knights come to the jousts half-heartedly. Expecting to fail, they do not fight their best. Therefore, I will not enter the lists this year, but, feigning weariness of spirit, will ride away."

King Arthur agreed to this, but Queen Guinevere spoke privately to him. "Sir Lancelot, so long as you are undefeated you will remain the champion. So ride away, but return well disguised. Unnoticed among the many newcomers, you can enter the lists as the Stranger Knight. Put it to the test if your prowess be as high as your fame."

So Sir Lancelot rode away. He borrowed the horse and fittings of a simple country knight, and his son for a squire. Leaving his own well-known shield of the golden lions in the keeping of Elaine, "the holy maid of Astolat," he pulled the visor of his helmet down and rode to the tournament.

In a raised pavilion above the field King Arthur sat with Queen Guinevere and the ladies, with the armoured and mounted knights of his



'While King Arthur and his court sat silent the Stranger Knight was led away'

court ranged below At the other end of the field were ranged noble youths from every part of the realm, among them the Stranger Knight When the trumpet sounded, all put spurs to their steeds, poised their lances and galloped forward, each party to unhorse as many of the other as possible The animals reared, spears rang on steel, swords crossed and shields clashed together, so close was the combat

Many a proud knight was unhorsed and borne from the field As the ranks thinned, it was seen that the powerful Stranger Knight was charging here and there, easily overcoming all with whom he contested One after another he tumbled even champions of the Round Table from their saddles

Alarmed and angry, they withdrew "Oh, that Lancelot were here!" they cried "This impudent fellow will disgrace us all" At that, forgetting the knightly code of honour, they all bore down upon the Stranger Knight His horse reeled from the shock His shield was struck aside A spear point pierced his breast plate The Stranger Knight lay bleeding on the field, when King Arthur rose and cried

"Foul play! It is an unknighly deed for so many to set upon a brave man"

They fell back in shame But the Stranger Knight staggered to his feet "Let me at them!" he shouted "Since they fight that way, I will vanquish them all at once"

Sore wounded and afoot as he was, his sword flashed to right and left, slashing at steeds and riders, until he unhorsed or sent all his assailants flying from the field

With a fanfare of his silver trumpet, the herald proclaimed the Stranger Knight victor, and bade him come forward and receive the ninth diamond

"Give me air! I have no need of diamonds, since I have my death wound Let me go hence to die in peace and follow me not"

While King Arthur and his court sat in sorrowful silence, the Stranger Knight was led away His squire bore Sir Lancelot to a hermit's cell, and pulled the spear point from his side Then the Lady Elaine brought him his own shield and the ninth diamond and eventually nursed him back to health

When Sir Lancelot rode again to Camelot

he was welcomed with rejoicing His prowess was proved to be as high as his fame, and he appeared in the lists no more And, having no lady of his own to adorn, he had the nine great diamonds set in a diadem which he presented to the fair Queen Guinevere

The Kitchen Boy who Became a Knight

Gareth, having learned gentle manners and all the feats of arms, wished to go to King Arthur's court and be a knight But his mother, Queen Bellicent, was a widow Her two elder sons were Knights of the Round Table So she wept and begged him to stay with her Seeing that he was determined to go, she thought of a clever plan to keep him

"Very well, my son, but you must go afoot, and in mean disguise You must tell no one who you are, and you must work for a year at the duties of a kitchen boy"

She thought Gareth would be too proud to do that But, knowing that he could still be a true knight in his heart, the noble youth put on the coarse clothes of a plough-boy and walked through the green land to the royal city of "many-towered Camelot" He had been in



'They saw forty knights hanging from the trees'

Illustrations by permission of George G Harrap & Co

the palace kitchen no more than a month when his mother relented and sent his sword and suit of armour, with a letter, to King Arthur. The King made Gareth a knight in secret, and promised that he should prove his worth by righting the first wrong.

That same day the fair Lady Lynette came to Arthur's court asking the aid of a knight. Her sister was a prisoner in Castle Perilous, guarded by four wicked nobles. Only the greatest of knights could hope to rescue her. Expecting Sir Lancelot or another champion of renown, she was angry when only a kitchen boy was sent, and treated him scornfully.

"Ride behind, as a servant should," she said, and she turned up a disdainful little nose, "you smell of kitchen grease."

Gareth was cruelly hurt by her scorn, but he did not forget the manners of a true knight. "Fair lady," he said, "I would rather fight four monsters at once than hear such unkind words from you," and took his place behind her.

Approaching the castle, they saw forty knights hanging dead from the trees on the lawn. When Gareth asked who these were, Lynette said they were knights who had come to rescue her sister and had failed. "If you also fail, you will be hung in the trees, like them," she said. But Gareth did not fail.

He slew all those wicked nobles, and led the Lady Lynette into Castle Perilous, to a happy meeting with her sister. The maiden was ashamed of her behaviour, and called the kitchen boy her true knight. Then Sir Gareth married the Lady Lynette, and for a wedding journey they rode back to Camelot.

Rousseau, JEAN-JACQUES (Pron rōō'-sō) (1712-1778) This famous Swiss-French philosopher gave better advice and followed it less than many another great man. He was born at Geneva, and in 1741 came down from the Alps to Paris. "He imported with him the jealous individualism of Geneva, an almost German sense of simplicity and tender homeliness, and the Italian's worship of the beautiful", and he imported all this into a French society which was organized to the point of artificiality, going like clockwork,

sure of itself, and warmly opposed to anyone who attempted to live contrary to its rules or to think something that was new or was not allowed for in its system.

Yet this curious, stammering, emotional little Swiss upset the whole elaborate society. From behind the scenes he had learnt much of its seamy side, and could not but be disgusted with many of its aspects. He wrote his great book on the origins of government, "Le Contrat Social" (The Social Contract), in which he argued that no laws are binding unless agreed upon by the people, and this so deeply moved the French that their political opinions changed

entirely. In fact, from Rousseau more than from any other one man came the force that caused the French Revolution, and his expression, "Liberty, Equality, and Fraternity," became the war-cry of those days of exaltation and horror. Another of Rousseau's books, entitled "Emile," converted people to a new, simpler, saner method of education, while "La Nouvelle Héloïse" was a pioneer of romantic French literature.

Yet the man who preached social equality and personal freedom was ever oppressed by poverty and by trying circumstances, the man who exulted in the beauties of Nature spent most of his days in a drab city, the man who taught modern hygiene dwelt in a stuffy and ill-furnished garret. An extraordinary mixture of idealism and human weakness, he revealed himself in his "Con-

fessions" (written in 1761-1771, but not published until 1781)—one of the most famous autobiographies ever written.

Denounced by the bishop of Paris for his views on religion, Rousseau fled the country to England. He later returned to France, broken in health and spirits, and a few years afterwards he died at Ermenonville, near Paris.

Rowlandson, THOMAS (1756-1827) In the history of British painting you will find several figures who owe their fame to their skill as caricaturists rather than as artists, but Thomas Rowlandson stands out as a caricaturist who was also one of the earliest masters of the peculiarly British art of water colour painting. His works are, indeed, easy to distinguish by their cleverly portrayed contemporary



JEAN-JACQUES ROUSSEAU

In this bronze statuette by Houdon, Rousseau is shown displaying a scroll of the "Social Contract"—the famous work of his which provided the French Revolution with a philosophical basis.

types, and by their generally satirical air. The fashionable rendezvous of London, Bath, and Brighton supplied the subjects for his most famous pictures, and yet in the realm of landscape and *genre* he could produce, in his own manner, work of the first rank. Most of his work was in water colour, outlined in pen and-ink.

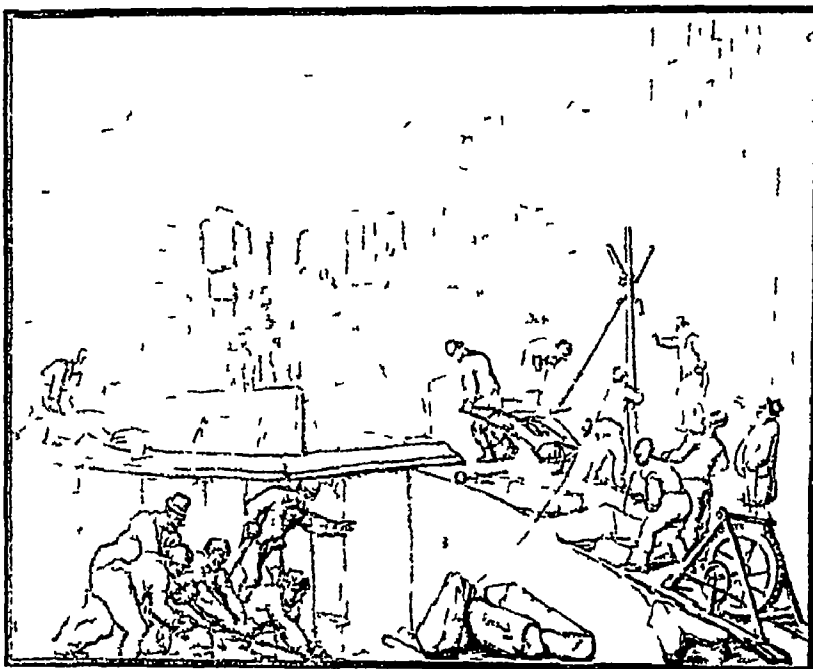
Rowlandson was born in London, but he certainly owed much of his style to an education in France, and, curiously enough, he began work as a painter of portraits and large historical pictures. But it was as a caricaturist that he finally made his mark, yet again, in his later years, he was equally well known as an illustrator, providing the drawings for the famous series of "Tours of Dr Syntax." He died in London, April 22, 1827.

Roxburghshire, SCOTTISH CO. One of the Scottish border counties, Roxburghshire is bounded by Midlothian and Berwick on the north, England on the south and east, Selkirk and Dumfries on the west. The Cheviot Hills form the southern boundary, the highest peak being the Cheviot itself (2,676 ft). The county is traversed by the rivers Tweed, Teviot (giving the alternative name, Teviotdale, to the county), Liddel, and Jed. The latter gives its name to the county town, Jedburgh (population, 3,000). The abbey at Jedburgh competes with Melrose Abbey for the title of the most beautiful ruin in Scotland. Melrose is a very ancient town of 2,100 inhabitants, standing on the Tweed. Three miles to the west lies Abbotsford (qv), home of Sir Walter Scott. Kelso (population, 3,900) stands close to the ruins of the town of Roxburgh.

The county has a total area of 666 square miles and a population of 45,800. It is very hilly in the north and south east.

Royal Family. In Great Britain and other European monarchies the term Royal Family includes all the descendants of the sovereign and of his or her predecessors.

Since 1917 the house name of the British Royal Family has been Windsor, taken by Royal Proclamation in July of that year. Succession to the throne passes first to the eldest son of the King, or, if there is no son, to the eldest daughter. Failing issue, it passes first to the King's brothers and then to his sisters. After



A CARICATURIST IN SERIOUS VEIN

Although he is now known chiefly for his caricatures, Thomas Rowlandson was also an important chronicler of the history of his own times. In this fine pen-and-ink drawing you see the demolition in 1817 of the last of the old Savoy Hospital buildings in London, notice that the tools and apparatus were much the same as those used today.

Reproduced by permission of Sir Edward Marsh

them the heirs to the throne are the King's uncles in order of "primogeniture" (birth) and their sons or daughters.

The title of Prince and the style of Royal Highness is now limited to the sons and grandsons of a ruling monarch. Thus the son and daughter of the Duke of Kent as grandchildren of King George V are Their Royal Highnesses Prince Edward and Princess Alexandra, but the eldest son of Prince Arthur of Connaught, who is the great-grandson of Queen Victoria, is the Earl of Macduff, that being the second title of his maternal grandfather, the Duke of Fife. The sons of the Princess Royal and the Earl of Harewood take only the courtesy titles of the sons of an Earl, being known as Viscount Lascelles and the Hon. Gerald Lascelles.

In two cases Princesses of the Royal Family on marrying commoners have elected to discontinue the use of the title of Princess. They are Princess Patricia of Connaught, second daughter of the Duke of Connaught, who since her marriage to the Hon. Alexander Ramsay, brother of the Earl of Dalhousie, has been known as Lady Patricia Ramsay, and Princess Maud of Fife, the second daughter of the Duke of Fife and the late Princess Royal, who since her marriage to Lord Carnegie, eldest son of the Earl of Southesk, has been Lady Maud Carnegie.

Under the Royal Marriage Act, passed in 1772, all the descendants of George II, with the exception of the issue of Princesses married to foreigners, are forbidden to marry before the

age of 25 without the King's assent. When they are over 25 years of age they can marry by giving 12 months' notice beforehand to the Privy Council, unless in the meantime Parliament decides against the proposed union.

Royal Household. The King's Household today is a large one, divided into several departments. The Lord Chamberlain is the chief officer, and controls all the household "above stairs" and all State ceremonies such as Levees, Courts and Investitures. With a few exceptions he licenses all the London theatres, and plays are censored by an official of his department. Hitherto this office has always been held by a peer. Under the Lord Chamberlain are the Lords in Waiting, the Grooms in Waiting, the Extra Grooms in Waiting, the Gentlemen Ushers and many other officials. Appointments to the Ecclesiastical Household and the Medical Household are made by the Lord Chamberlain.

The Lord Steward presides over the Board of Green Cloth and has authority over all the

Royal Officers other than those controlled by the Lord Chamberlain and over all the servants. The Private Secretary's Office includes the Private Secretary to the King, three Assistant Private Secretaries and a staff of clerks.

Other departments are those of the Keeper of the Privy Purse, the Financial Secretary's Office, and the Royal Mews Department, which is in the charge of the Crown Equerry under the Master of the Horse and controls the Royal stables. The Honourable Corps of Gentlemen at Arms, which is on duty as the King's bodyguard at State ceremonies within doors, and the King's Bodyguard of the Yeomen of the Guard, are also included in the Royal Household. The King has a separate Household in Scotland.

The Queen has a separate Household, under a Lord Chamberlain, which includes the Treasurer, the Private Secretary, the Mistress of the Robes, the Ladies of the Bedchamber, the Women of the Bedchamber, and the Extra Women of the Bedchamber. Other members of the Royal Family have Households of their own.

The ROMANTIC STORY of RUBBER

It is not much more than a hundred years since rubber was first put to a practical use, yet today how should we live without this invaluable "plant-juice" Its uses and processes are described here

Rubber. Imagine a world without rubber—no rubber for motor-car or bicycle tires, no rubber for heels and "wellingtons" and rain-coats, no rubber for the shoes and the balls we use for tennis, football, netball, squash, and golf, no rubber on the school-desk! Today rubber is used in the manufacture of over 50,000 articles, a century ago it was scarcely known except as a curiosity. The rubber products turned out in one year run to a value of perhaps £500,000,000.



Spanish explorers in Mexico reported that the Indians played a game with a bouncing ball made from the dried gum of a tree which they called caoutchouc, or "weeping tree," because it gave forth a juice so freely that it seemed to be shedding tears. A few years later the soldiers of Pizarro learned from Peruvian natives to cover footwear and clothing with this waterproof juice.

Rubber was named, however, by Dr. Joseph Priestley, the discoverer of oxygen. In 1770 a friend in America sent him a ball of crude

rubber. Discovering that it would rub out pencil marks, he broke off small pieces and called them "rubbers"—and because they were used by the American Indians, the name became "India rubber."

In 1818 James Syme, a brilliant 19-year old medical student who later became professor of surgery at Edinburgh University, found that coal-tar naphtha would dissolve the dried gum, and that cloth could be waterproofed by pressing thin sheets of the dissolved gum between pieces of fabric. Charles Macintosh, a manufacturing chemist of Edinburgh, patented Syme's process in 1823, and made waterproof garments, which are still commonly called "macintoshes."

Pure rubber, however, gets soft, sticky, and disagreeably odorous in warm weather, while cold makes it brittle. Articles made from it were unsatisfactory until vulcanization was discovered in 1839 by Charles Goodyear, an American hardware merchant.

Goodyear got the idea that the defects of rubber might be overcome by treating it with some other substance. In his search for the right substance he became so engrossed that his own business failed, and even success came at last partly through accident, when he was displaying a mixture of rubber and sulphur. The piece slipped from his hand into the fire, and when he took it out he found to



TAPPING TREES ON A RUBBER PLANTATION

Rubber is the most important item of export in Malaya, and rubber plantations have been developed there both on the coastal plain and on the undulating land behind. The trees have to be tapped deep enough to obtain the maximum amount of latex, or sap, without injuring them. The incisions made in the bark can be clearly seen in this photograph of natives at work on a Malay rubber estate.

his amazement that the mass had charred without melting. It was not sticky, and when it was stretched it sprang back into its original shape. Also, frost did not make it brittle.

Goodyear named this process of combining rubber with sulphur by heat "vulcanization" (from Vulcan, the god of fire). Later, he discovered how to make the compound stronger and tougher, and more easily manufactured.

Goodyear is entitled to all credit for his great discovery, but thousands of research workers have been working and are still working to improve vulcanization methods, on the efficiency of which vast industries depend.

Crude rubber consists of five parts carbon and eight parts hydrogen, but the chemical reactions produced by vulcanizing and other processes in the manufacture of rubber are largely unknown.

The elasticity of rubber is believed to be due to its combined liquid and crystal structure, the liquid occupying the narrower spaces between the crystals. When the tiny crystal particles are pulled apart, the liquid between them continues to form a link of attraction, so to speak, which draws them together again when the pull ceases. When the rubber is compressed, the liquid squeezes out until it

fills the larger uncompressed spaces, but later returns to its normal position. Rubber can be made softer than sponge, lighter than cork, or as hard as iron.

Until the early part of the present century nearly all the rubber of commerce came from wild rubber trees on the highlands and divides of the Amazon district in South America and from the rubber vines of the African Congo. Now, however, more than nine tenths of the world's rubber comes from plantations in British Malaya, Ceylon, and the Dutch East Indies. Minor sources of supply are India and Burma, Brazil, Liberia, and the Philippines.

The plantation rubber industry of the Middle East is due to the work of Sir Henry Wickham, who spent years in Brazilian jungles studying the rubber tree. British officials commissioned him to gather seeds for experimental planting at Kew. Wickham took an ocean-going vessel far up the river Amazon, and placed on board 70,000 rubber-tree seeds. In 1876 seeds from the Botanical Gardens were sent to Ceylon, and, after prospering there, were planted in Malaya, Sumatra, Java, and Borneo.

Rubber is made from the latex, or rich milky juice, of certain tropical vines and trees. The caoutchouc tree, *Hevea brasiliensis*, is the only

one of importance in the industry today. Latex is not the ordinary sap of the tree, but is secreted in a network of passages in the soft inner bark, just outside an inner skin, called the cambium, which covers the wood. When the tree is wounded, the latex oozes out, hardens, and closes the wound. Latex consists of myriads of tiny globules suspended in a watery fluid. Besides rubber globules and water, latex contains other substances, such as sugar, salt, and proteins in small quantities.

On rubber plantations, the standard method of collecting rubber latex is as follows. A spiral cut about a quarter of an inch wide is made in the bark about four and a half feet from the ground, or a straight-down cut is made with diagonal cuts running into it—the "herring-bone" method. This cut must be made with great care, or the tender inner covering protecting the wood will be punctured and the tree will die. A cup is fastened below the cut. A few drops of ammonia, formalin, or soda are put in, to keep the latex from hardening. When the flow ceases, more bark is shaved to permit more juice to flow.

Natives collect the latex from the cups and pour it into flat pans. The rubber is separated from the rest of the latex usually by adding acetic acid, which causes the rubber particles to clot or coagulate and rise to the surface in the form of a thick sheet. Iron rollers squeeze out the liquid from these sheets. In preparing crêpe—a large, thin, crinkly sheet—the rollers revolve at unequal speeds, and the sheets are hung up to dry for about three weeks. For smoked sheet, usually prepared in sheets thicker than crêpe, the rollers revolve at equal speed and the pieces are dried by smoking for 10 to 14 days.

Little rubber now comes from its original home in the Amazon jungles. There the natives collect the latex in the most primitive fashion. Each gatherer has a number of trees, between which he cuts paths. Early in the morning he taps the trees and attaches cups. When all the trees have been tapped, he



RUBBER READY FOR SHIPMENT

This native of Colombo, the capital of Ceylon, is busy packing sheets of raw rubber into boxes ready for shipment. Over 600,000 acres of land in the island of Ceylon are devoted to rubber plantations, the annual export averaging about 140 million pounds in weight.

Photo Dorien Leigh

begins collecting the latex into a rubberized cloth bag on his back. Then, in his palm-thatched hut, he builds a fire in a pit covered with clay, which has an opening for the smoke to escape. Using a little latex that has coagulated naturally overnight, he starts a ball on a pole above a smoky fire. He keeps pouring latex over the ball and rolls it over and over until he has a "ham" of 10 to 20 pounds.

Tires and rubber tubes are today the principal products of the rubber industry. About 80 per cent of all rubber goes into them. In 1845 Robert William Thompson, an Englishman, invented and patented a process of making pneumatic tires with a rubber tube protected by an outer casing of leather. A set of carriage tires of this type lasted for 1,200 miles. In 1888, John Boyd Dunlop, of Belfast, made a rubber tire for his son's tricycle, and patented the process the same year. In 1890, he began to manufacture bicycle tires.

Before the motor-car became common, the world used only about 60,000 tons of rubber a year, but over 850,000 tons are used today.

At the factories crude rubber, with reclaimed rubber often added, is torn and kneaded with water between two heavy iron rollers about six feet long. One moves faster than the other, and the two are set from one-fourth to three eighths of an inch apart. When the rubber is soft and plastic, sulphur and accelerating agents are poured into it, and the milling continues until the compound is thoroughly mixed. Another machine, the internal mixer, has rollers which rotate in opposite directions in a closed compartment, to grind the rubber and compounds together.

Rolling the Rubber

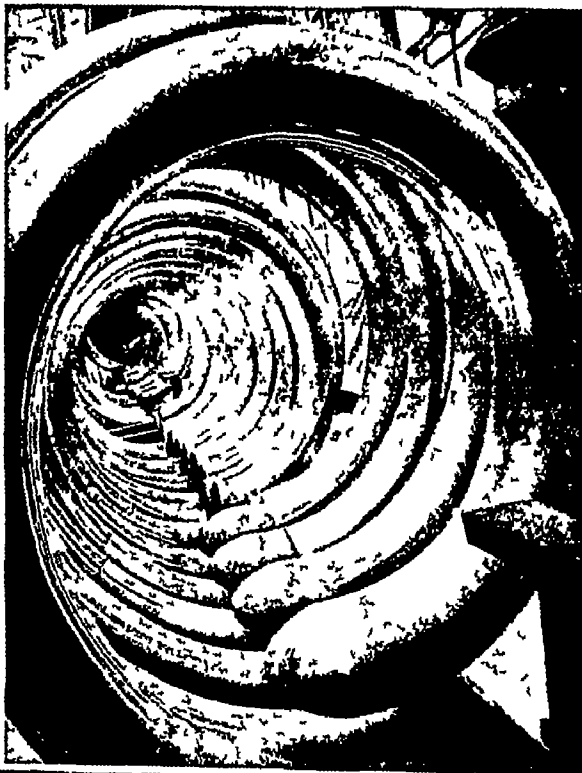
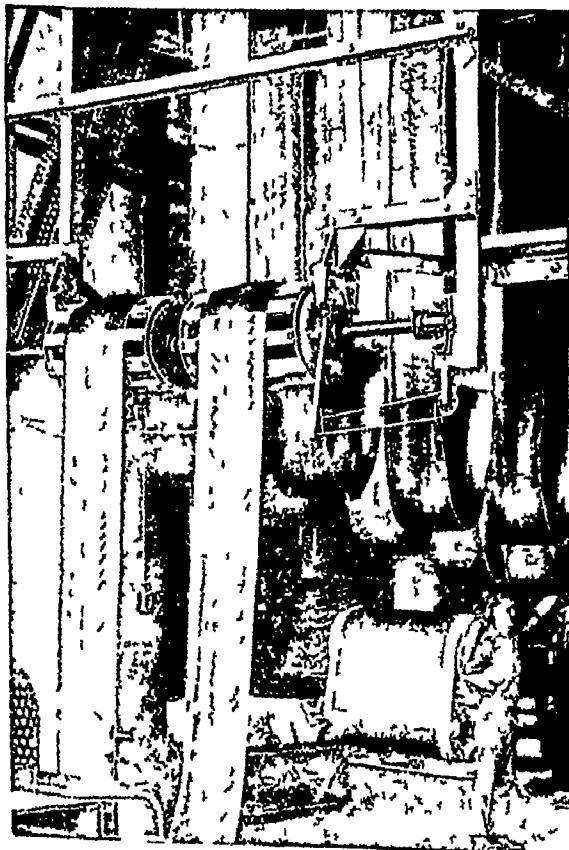
The next step is calendering. A calender consists of three hollow iron rollers, one above the other, with steam or water passing through the rollers to regulate the temperature. The calender may press the rubber into sheets of varying thickness, or lay a coat of rubber on different fabrics, or grind or "friction" the rubber into fabrics. In this last process, the

RUBBER

upper roller, around which the rubber runs, moves faster than the lower roller, against which the cloth travels. The rubber is ground into the cloth between the lower rollers so that every thread is completely surrounded by a film of rubber. Cord tire carcasses are sometimes made from cotton cords run off spools through a solution of latex.

The mixture for motor car treads contains carbon black, sometimes as much as 30 per cent. Carbon black gives toughness to the rubber and increases the mixture's resistance to abrasion. A motor car tire "casing" is ordinarily formed by stretching strips of frictioned or coated cord fabric, cut on the bias to the proper width, round a collapsible iron core, or round a wide flat drum. The bead, which holds the tire to the rim, is put on each side, and then more strips of fabric are added. The layers of fabric and the bead are rolled smooth, the tread wall and side wall rubber are put in place, and the core is removed from the tire, or the tire is stripped from the drum. A heavy rubber "air bag" is inserted in the tire and held by iron rims, then the tire goes into a curing mould shaped inside to produce the tread design. The next process is "curing" or vulcanization. The vulcanizer is

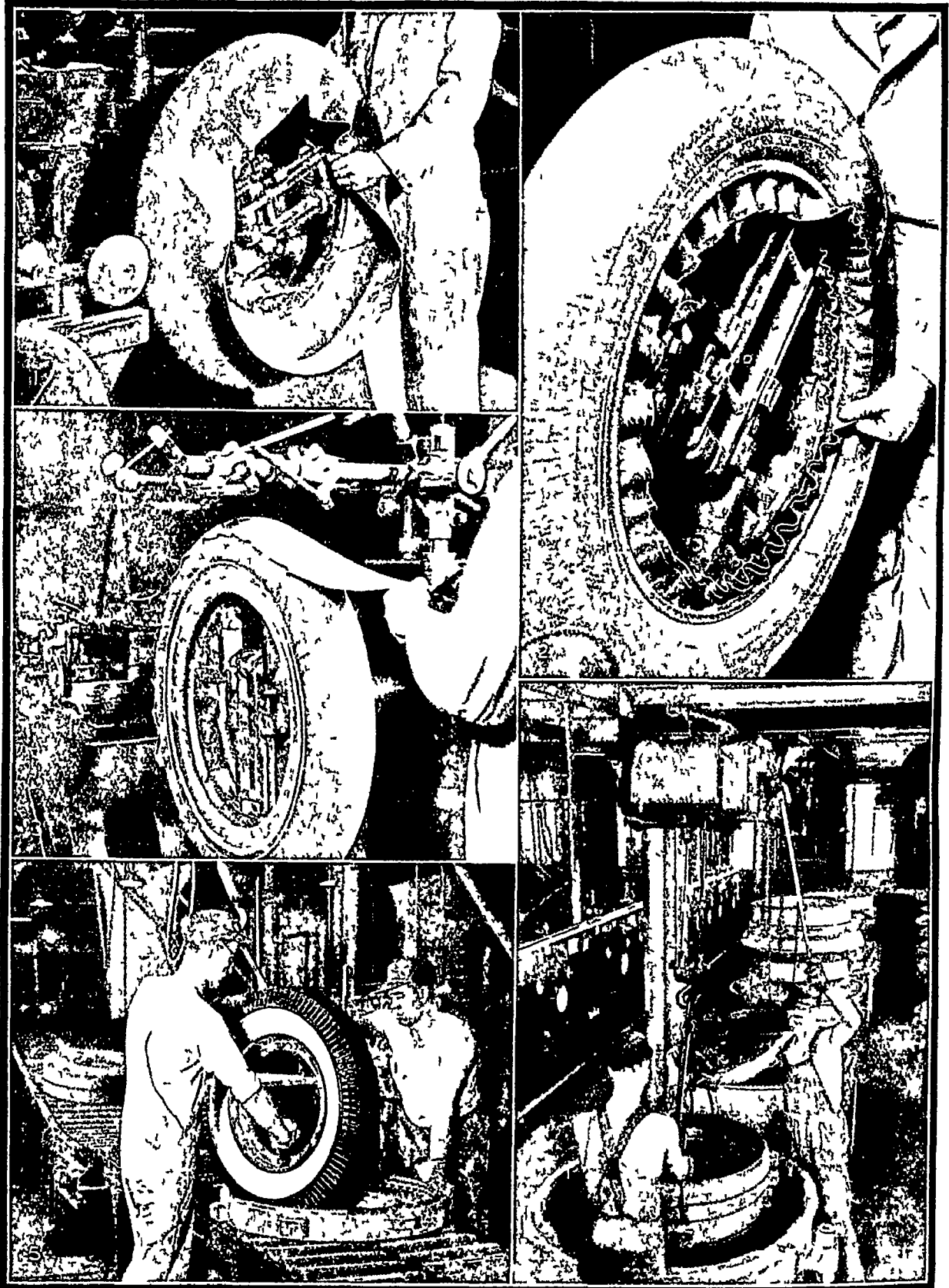
closed tight and steam is forced in. The time required depends on the accelerating agents used, the ingredients of the compound, and the intensity of the heat. Inner tubes are sometimes made from calendered sheets of rubber, wound round "mandrils" or cores and afterwards vulcanized. Each sheet is two or three times the circumference of the mandrils. The plied construction resulting produces tubes without seams—a safeguard against leaks. The ends of the rubber are trimmed and wrapped tightly with cotton tape to keep water from getting between the rubber and the mandril while the tubes are being cured in hot water under pressure. After the curing, the tubes are stripped from the mandrils by compressed air, holes are punched for the valves, and the valve



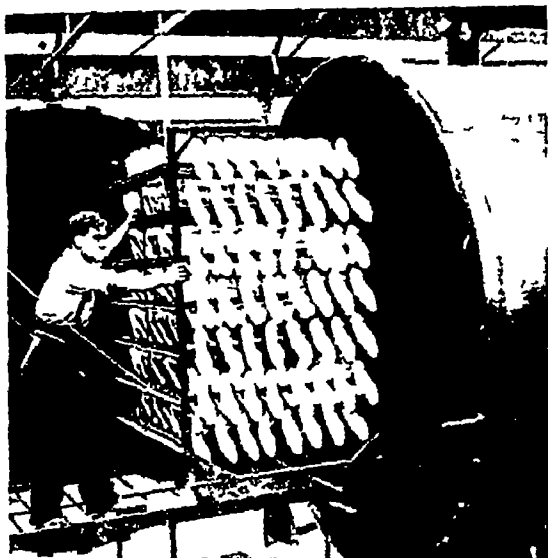
MAKING RUBBER TIRES AND INNER TUBES

Mixed rubber with carefully-proportioned ingredients passes through this machine in sheet form. By regulating the speed of the machine the width and thickness of the rubber are held to the correct size for the tire on which it is to be used. After leaving the machine the long strips of tread are hung up to cool and contract. The queer-looking machine seen in the upper photograph is used for vulcanizing inner tubes. The spiral tubes are the mandrils, round which the rubber sheets are wound.

RUBBER'S LAST STEPS FROM JUNGLE TO HIGHWAY



1 The cord fabric is cut into bias strips, to give strength, and these strips are applied over an iron core. 2 After several plies are put on, the bead is set in position and locked into position by folding the plies back over it. 3 Next, a breaker strip, mounted on gum rubber, is applied to form a foundation for the tread, which is put in place immediately afterwards. The side wall is then applied and the tire is ready for curing. The core on which it is made is removed and the tire is inserted in an iron mould. A rubber air bag is placed inside and steel rings are locked into place to form the correct bead. 4 The mould is lowered into the vulcanizer, where a hydraulic press holds the two halves of the mould together. 5 The completed tire, after a cure of from one to five hours, is being taken from the mould. Here the air bag and the bead rings are removed and the tire is ready for inspection, balancing to find the proper place for the valve, when the tire is mounted on its rim, and finally wrapping in a machine which winds a continuous strip of tough paper about the tire. It is then shipped to the dealer.



Fox Photos

RUBBER SHOES IN THE MAKING

The rubber shoes seen above are nearly finished. They are stacked on a trolley which is just about to be wheeled into the vulcanizing apparatus visible on the right. The process of vulcanization hardens and toughens the rubber.

stems and bases are placed inside the tubes. The ends are coated with rubber cement and lapped one over the other, and the lap seams are vulcanized. They are inflated, inspected, and packed.

Most garden hose is made by winding a tube of rubber, 500 feet or so long, on a drum, or on a flat circular disk, with just enough air inside to keep it from flattening. From the drum it is fed through the centre of the braiding machine, which puts a continuous braided layer of cotton over the rubber. The hose then goes through another tubing machine, in which a layer of rubber is placed over the cotton braid. At the braiding machine it is given a second layer or ply of cotton. This process is repeated according to the number of plies wanted. Hose is sometimes cured in a press which vulcanizes 20-foot sections at a time. In another process, the hose is covered with a sheet of lead in a lead press, and 500 feet of it, or more, are wound round a drum, which is put in a cylindrical vulcanizer. The hose is cured by hot water forced through the hose and steam forced into the vulcanizer. Another type of hose is made by wrapping fabric round rubber tubes on mandrels and then coating with more rubber.

Tennis balls are made of four segments of prepared rubber. These are sewn together with a small disk of pure rubber on the inside. A few drops

of water are placed in the ball, and when it is cured in a mould, the water changes to steam and blows up the ball to make it fill the mould. After the curing, a hollow needle is inserted at the point where the disk is attached, and compressed air is shot into the ball. When the needle is withdrawn, the disk acts as a valve and closes the hole. The ball is then covered with flannel, cemented, and sewn.

Rubber hose, channel rubber to go round the movable windows of motor cars, and similar products are made by a tubing machine which moulds rubber into the desired shapes.

Many attempts have been made to prepare rubber synthetically, but with varying success. The tendency is to make different sorts of synthetic rubber, suitable for certain jobs.

Reclaimed rubber plays an important part in the industry. It is made by grinding scrap such as old tires, and destroying the impurities in a heated solution of sulphuric acid or caustic soda. It is used only for boots and insulating compounds, or mixed with ordinary, new rubber.

Rubens, PETER PAUL (1577-1640) The Flemish city of Antwerp is proud of being "the city of Rubens," one of the world's greatest



Tate Gallery

SELF PORTRAIT BY RUBENS

This fine study of Rubens from the painter's own brush was lent by the King from the Royal collection for inclusion in the Royal Academy Exhibition of 17th-century art in Europe, held in 1938. Rubens was knighted by Charles I in 1630, while in England on a diplomatic mission.

painters But, though a citizen of Flanders during the period when it was a possession of the Spanish king, Rubens was born in Germany while his father was an exile from his native land

For eight years he studied in Italy at the court of the Duke of Mantua, then he was called to the court of France to decorate the palace of the Luxembourg in Paris, and he was knighted by Charles I of England and by Philip IV of Spain when he negotiated peace between them in 1627

But, above all, he was the artist who took the best from the art of the Italian Renaissance and united it to the best from the art of the North, adding his own individual colouring and boldness of design, to create an influence that was felt throughout the continent of Europe for generations after his death

Fame and Riches Come to Rubens

In his palatial home in Antwerp Rubens entertained scholars, nobles, and sovereigns Pupils flocked to him in such numbers that there was always a long waiting list and orders for paintings came so fast and were of such vast size that only the design and finishing touches could be done by Rubens The filling-in was usually done by his paid assistants and pupils Van Dyck, one of the world's foremost portrait

painters, was one of the many who served in the Antwerp studio Even while Rubens was acting as Spanish ambassador in England he found time to indulge in his art

Master of Every Branch of Painting

He excelled in every kind of painting In the 1,300 paintings to his credit there are animals as skilfully done as if he had spent his life painting nothing else His landscapes and mythological pictures are masterpieces His portraits rank among the finest of all ages, and his religious paintings are among the most celebrated in the world of art

Rubens' private life makes a companion piece to the bright picture of his public career His domestic life was most happy He has left charming pictures of his wife and children, and his beautiful second wife, Helena Fourment, is perhaps the most frequently-painted woman in history

Probably no other reputable artist has covered such a vast area of canvas Rubens delighted in gigantic compositions He was never so happy as when he was finishing a huge wall painting for a palace or a cathedral He was the master artist of his day, who had learned all that others could teach him and then gone beyond all his many masters

The 'OIL' KINGDOM of the BALKANS

Rumania, from 1919 to 1940 perhaps the most powerful of the Balkan States, sank in the latter year into a mere satellite of Germany Her immensely rich oil deposits, however, continue to give her some importance

Ruma'nia. After the War of 1914-18 the territory and population of this Balkan Kingdom were more than doubled In 1939 it had 122,000 sq miles and 17,393,000 people But in 1940 came a reversal of fortune, and it was left with but 81,000 sq miles and 10,900,000 inhabitants

This region, just north of the lower Danube, was the Roman province of Dacia under the Emperor Trajan, and its present inhabitants claim descent from Roman colonists of that time, and regard their land as "an outpost of Latin culture set in the East" In appearance and language, the Rumanians are like the Italians, though with much Slavic admixture

At the end of about 400 years of Turkish rule, during which there were costly struggles also with Poland, Hungary and Russia, the Treaty of Paris (1856) recognised the two provinces, Moldavia and Wallachia, which lay between the Carpathian Mountains and the Black Sea, as

Extent—81,000 square miles **Population** 10,900,000

Physical Features—The rivers Danube and Dniester flow into the Black Sea Other rivers include the Jiu, Aluta, Agesul, Sirut, and Pruth The chief mountain ranges are the Carpathians and Transylvanian Alps

Principal Products—Mainly agricultural, maize, wheat, rye, oats, and barley, vines, cattle and sheep Abundant forests Minerals salt and oil

Chief Towns—Bucharest (capital, population 644,200), Braila (chief port, 68,000), Jassy, Galatz, and Constantza

self-governing parts of the Turkish Empire

Their coalition in 1862 formed the new nation Rumania (or Roumania), to which a German (Hohenzollern) prince was given in 1866 In 1878 complete, independence was achieved In

the second Balkan War (1913) Rumania aided Serbia, Greece and Montenegro against Bulgaria, and was rewarded by a slight extension southward of the Dobruja on the Black Sea

In the War of 1914-18 Rumania was ravaged by a German-Austrian-Bulgarian army in 1916 and forced to sign a humiliating peace But the Treaty of Versailles (1919) rewarded Rumania by giving her the former Hungarian territory of Transylvania (west of the Carpathians), the former Austrian district of Bukovina (on the north), and Bessarabia (across the river Pruth to the east) which had been a part of Russia (For map, see page 398) Most of these territorial gains, however, were lost to Rumania in the autumn of 1940

AT CHURCH IN A TRANSYLVANIAN VILLAGE



some religious communions and in certain churches, it is still customary for a separate portion of the building to be set aside for each sex while Divine Service is being held. Among the Saxons of Transylvania, the great agricultural region of Rumania the women always sit apart from the men in church. The women here seen wearing hats are unmarried, the wearing of the head-veil, or marama, is the mark of a married woman.



E N A

GAY COSTUMES OF RUMANIAN DANCERS

The Calusari, one of the national dances of Rumania, is performed by men only. Dressed in these gay clothes, with tinkling bells at their knees, they dance in the open air at fairs and festivals to the music of the flute, the lute, and the violin, played by ragged gypsy musicians. In another dance, the Hora, women also take part.

RUMANIA

More than 80 per cent of the people are farmers, and most of the peasants own their own small farms since the great estates were broken up after the War of 1914-18. Methods of these small farmers are almost primitive, but the government is trying to aid them by selling them modern implements at low cost, and by supplying them with high grade seed. Water buffaloes and slow-moving oxen are the chief draught animals, and reaping is still often done with sickle and scythe.

The rich, deep soil of the Danubian plain makes Rumania one of the great wheat- and maize growing centres of the world. Other important crops are beans, potatoes, sugar-beets, and tobacco. The hill region between the plain and the mountains is well adapted to fruit growing, and Rumania is noted for its red and white wines and its plum brandy.

The forests which clothe the slopes of the towering Transylvanian Alps (part of the Carpathian system) furnish abundant timber, and the mineral resources—rock-salt, coal, marble, petroleum, etc.—are very great. The Rumanian oil fields, among the most important in Europe, are one of the chief resources of the kingdom. The State controls the mines and forests, and also the chief railways.

In winter the cold north east winds send the thermometer below zero, and for three months the broad, spacious Danube, Rumania's chief artery of commerce, lies ice locked, and the ports of Galatz and Braila are quiet. The summers, on the other hand, are tropically hot. Spring with its blooming fruit trees, and autumn with its harvest are all too short.



M O Hencho

PICTURESQUE RUMANIAN PEASANTS

These peasant women from the Carpathians, the chief range of mountains in Rumania, still wear the attractive costume you see in the photograph above. Most of these dresses are woven by the peasants themselves.

At Cernavoda a great bridge twelve and a half miles long crosses the Danube and its wide marshes, carrying trains from the capital

Bucharest across "the stony region" (the Dobruja) which separates Wallachia from its chief Black Sea port, Constantza. A famous section of the Danube is that between Orsova and Turnu Severin, where the river rushes through the gorge of the Iron Gates.

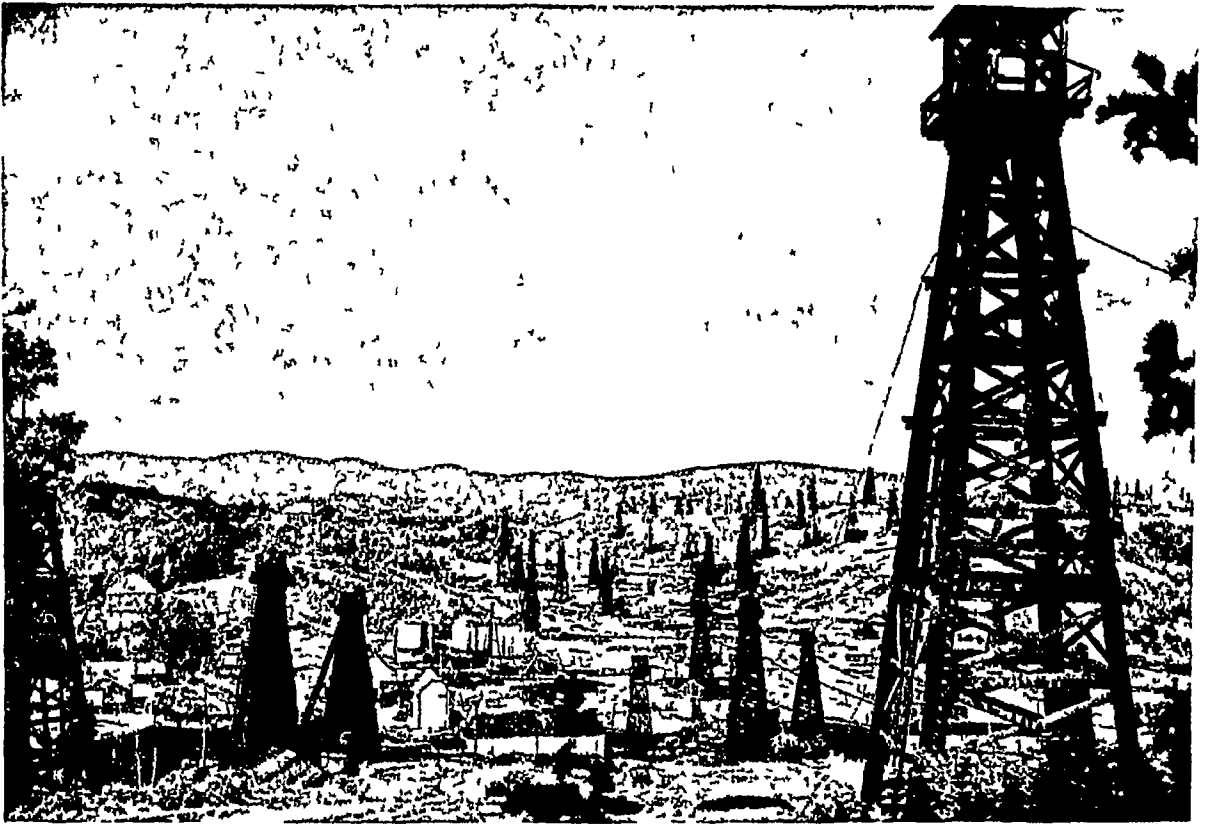
To the west of the Transylvanian Alps lies the rich and picturesque upland region of high mountains and valleys called Transylvania, which, until 1919, was part of Hungary. About a fourth of the land is used for agriculture—rye,



M O Henchos

A GLIMPSE OF PASTORAL RUMANIA

Vast areas of Rumania are covered with mysterious forests and green mountains pasturing large flocks of sheep, guarded by wild-looking shepherds, who are content with their slow moving open-air life. Here you see a quiet rural scene in the Oltu valley, in Transylvania.



RISEING DERRICKS OF RUMANIA'S OIL-FIELD

M O Henchot

Petroleum is one of the chief products of Rumania, and large deposits are found in the central hills. Some of the most productive wells are in the Prahova district, such as those at Moreni, a general view of which is seen above. The tall wooden structures are called derricks, and are towers for hoisting or lowering material. Rumania ranks fifth among the oil countries.

wheat, oats, and potatoes being the chief crops, fruit raising is extensive, and there are vast pastures for sheep, cattle, and horses. Forests of coniferous trees, beeches and oaks clothe the mountains. Transylvania is also rich in minerals. Flat, rich Bessarabia is a river threaded province of farms and pastures. Thickly-forested little Bukovina has unusual churches and monasteries, with paintings all over their outside walls.

The Orthodox Eastern Church is the established Church of Rumania. One-twentieth of the total population, a larger ratio than in any other country of the world, are Jews. Rumanian bitterness against them is chiefly due to economic reasons. In addition to political disabilities, there were formerly very stringent laws against Jews owning land outside the towns, of recent years anti-Semitism has become very pronounced. True Rumanians or Vlachs make up about 70 per cent of the total population. Other inhabitants of foreign descent are Magyars, Germans, Russians, Poles, gipsies, Greeks, Turks, Tartars and Bulgarians.

The simple peasants forget the hard toil of the week as they dance on Sundays, the men in brightly stitched sheepskin jackets, the women wearing scarves, gay aprons, and full blouses richly embroidered in vivid, harmonious colours by their own hands. The thatched, white washed cottages are warmly built, usually with

verandas running round them. Nearly every thing is made at home, from the men's goat skin sandals and the hand-woven linens to the tall stoves. The daily diet, highly seasoned with red pepper, consists chiefly of corn, porridge, and vegetables, with a bit of pork and chicken. Though Rumanians are themselves skilful with violin, guitar, and flute, they always call upon the gipsies to play at their festivals. When the peasants get together on winter nights, they sing and tell of wars and heroes, of spirits and legends—the wild, sad folk-tales of the Balkans.

The peasants, who are still largely illiterate, speak Rumanian, but the educated and upper classes use French.

Important Towns and Cities

Bucharest (*g v*) is the capital. Jassy (population, 104,000), the former capital of Moldavia, is second in political importance to Bucharest. Other important towns are Chisinau in Bessarabia, Cluj in Transylvania, and Cernauti (former capital of Bukovina). Constantza, on the Black Sea, and Galatz and Braila, at the head of the Danube delta, are busy ports for the export of grain, timber, and petroleum. Galatz is the headquarters of the European Commission of the Danube, which controls the river from Braila to its mouth.

Achieving its independence in 1877, Rumania had as its first sovereign Prince Charles of Hohenzollern, who reigned as Carol I from 1881 until

his death in 1914 His son Ferdinand followed him on the throne, and when he died in 1927 he was succeeded by his grandson, Prince Michael, a boy of six In 1930 the latter's father, who had previously renounced his succession to the throne, returned to the country and took his son's place as King Carol II During his some what uneasy reign Carol showed both states manship and personal courage, but his failure to consolidate his kingdom amid the envious pressure of the Axis powers and Soviet Russia ended with his abdication on September 6, 1940, in favour of his eighteen-year-old son Michael What was left to Rumania after Russia, Hungary and Bulgaria had re occupied provinces formerly belonging to them passed temporarily into the hands of the pro German element in the country (the Iron Guard)

Running. As soon as you can run, which is when you are very young indeed, you start to try to run races with other children, and if you are at all keen on sports you are sure to have to do a good deal of running

In the days of the old Greek games running races were the most important events, and although it was not until about the middle of the 19th century that attempts were made in Britain to encourage foot racing, once interest in this form of sport had been raised, it did not take long for it to obtain a firm hold

Now there are running events at every athletic meeting, and all over the world men and women give their attention to training and practising in order to run ever faster and faster over given distances These

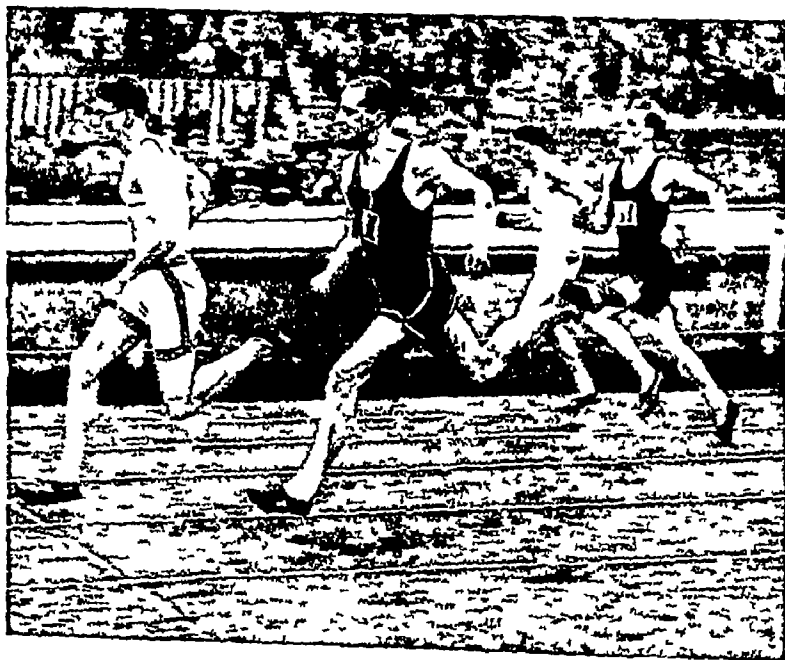
running events are divided into sprints, middle, and long distance races A sprint race, which is anything up to 440 yards—a quarter of a mile—is run straight through from start to finish, without the runner getting his "second wind", it is a concentrated effort over a short distance The great middle distance events are the mile and half-mile, and of these the latter requires perhaps the finest judgement of all The mile, however, also requires a great deal of judgement, not only of one's own powers but of those of one's opponents It has seen some of the closest and most exciting races ever run The most usually run distance beyond this is the three miles, beyond that are races of five and ten miles, and, finally, greatest of long-distance races,

the Marathon (*qv*), which is traditionally run over roads for a distance of 26 miles, 385 yards The A.A.A. championship (Amateur Athletic Association) Marathon race is run from Windsor, and finishes, as these events usually do, with one or two laps round the stadium in London in which the championships are being held

Training for running events is a very serious matter, and the greatest runners have to keep in training for years at a stretch That is partly why in recent years the English have been less successful than formerly, since, with other nations, men likely to reach international standard have facilities whereby they need not work in offices or workshops which give little chances for training Marathon runners actually train for years, there are never more than a dozen or so really first class Marathon runners in training at the same time

World's Greatest Runner

One strange thing about running is that the men of various nations have been especially famous for different events Thus, the Americans—and recently, the American negroes—have been the world's leading sprinters, while the British have long excelled at the mile and half mile events Over long distances the Finns are the acknowledged experts, and one of them, Paavo Nurmi, is still regarded as the greatest runner the world has ever known, for he was the winner of Olympic championships at everything from 1,500 to 10,000 metres, as well as the holder of world's records over those distances In almost every country but Britain running



'ALL OUT' IN A SHORT SPRINT

Sport & General

In every kind of running there are several different styles, for the man who is covering a hundred yards sprint will use a different stride from that employed by a Marathon runner with some twenty-six miles to cover Here is a photograph of a hundred yards sprint at the Polytechnic Harriers Athletic Meeting at the White City, London

RUSKIN

events are held over metric distances (*see under Records in the Fact-Index*)

Besides these "flat" races, there are hurdles and steeplechase events, the latter with artificial jumps, these are the track equivalent to the cross-country running of the open field. Cross-country running is itself a very flourishing sport in England, and even round London there are hundreds of clubs which hold events every weekend, there are national championships and international matches, too (*See also Athletics, Olympic Games*)

Ruskin, JOHN (1819-1900) From the time Ruskin was a young boy until he was about forty years old his writings, which were many, were mostly about painting and architecture. His "Modern Painters," "The Seven Lamps of Architecture," and "The Stones of Venice" gave the people of Queen Victoria's reign a new interest in art, and a new point of view towards it.

But when he was about forty he began to be more interested in humanity than in art, and he became a social reformer. His writings changed, and began to describe what he thought would be an ideal state of society and how he thought this could be brought about. He was not content with writing, and he founded many different kinds of institutions and model experiments, which, unfortunately, all failed, except one art museum. To this stage of his development belongs his well-known "Sesame and Lilies," a series of lectures on what constitutes good literature.

Almost as important as the things Ruskin said is the way he said them. He wrote beautiful clear English, at times very simple and straightforward, and at times rather highly decorated and coloured—but always beautiful.

Ruskin was born and lived in England. His father was a Scottish wine merchant who settled in London, and as John was their only



RUSKIN AT THIRTY-FOUR

Here is Millais' famous portrait of Ruskin standing on the rocks at Glenfinlas. In 1853 Millais went to Scotland with Ruskin, and this visit was destined to have a profound effect on the lives of both men. Mrs. Ruskin sat for Millais' well-known picture "The Order of Release."

RUSSELL

son the parents devoted themselves almost entirely to his education, travelling with him through Europe. Some of the best artists in England taught him drawing and painting. Later he went to Oxford, where he won a prize for poetry and took his degree in 1842. In his later life he was Professor of Art at Oxford, until his health failed and he retired. From his father he inherited a substantial fortune, which he applied to his reform schemes, maintaining himself by his writings.

His autobiography, "Praeterita," tells of his early life. His total works amounted to more than fifty volumes, and amongst them is a charming fairy story, "The King of the Golden River." Brantwood, Ruskin's home on the shore of Coniston Water, in the Lake District, is preserved as a museum.

Russell, BERTRAND, 3RD EARL RUSSELL (born 1872) Though a member of a great political family—his grand-

father was twice Prime Minister—Bertrand Russell is famous as a mathematician and scientific philosopher. Among his many books are "The A B C of Atoms," "The A B C of Relativity," and "Problems of Philosophy."

But he is also keenly interested in social questions, and such books as "Principles of Social Reconstruction," "Roads to Freedom," "Marriage and Morals," and "The Conquest of Happiness" have exercised a great influence on thoughtful men and women in all countries.

One of the most discussed writers of his age, Russell is never tired of urging the supreme importance of expressing one's individuality in some form of creative activity. He succeeded to the Russell earldom in 1931.

Russell, JOHN, 1ST EARL RUSSELL, (1792-1878) "Woburn, August 18, 1803. This is my birthday. I am 11 years old today." This is the first boyish entry in a great mass of journals and memoirs in which John Russell, Whig leader

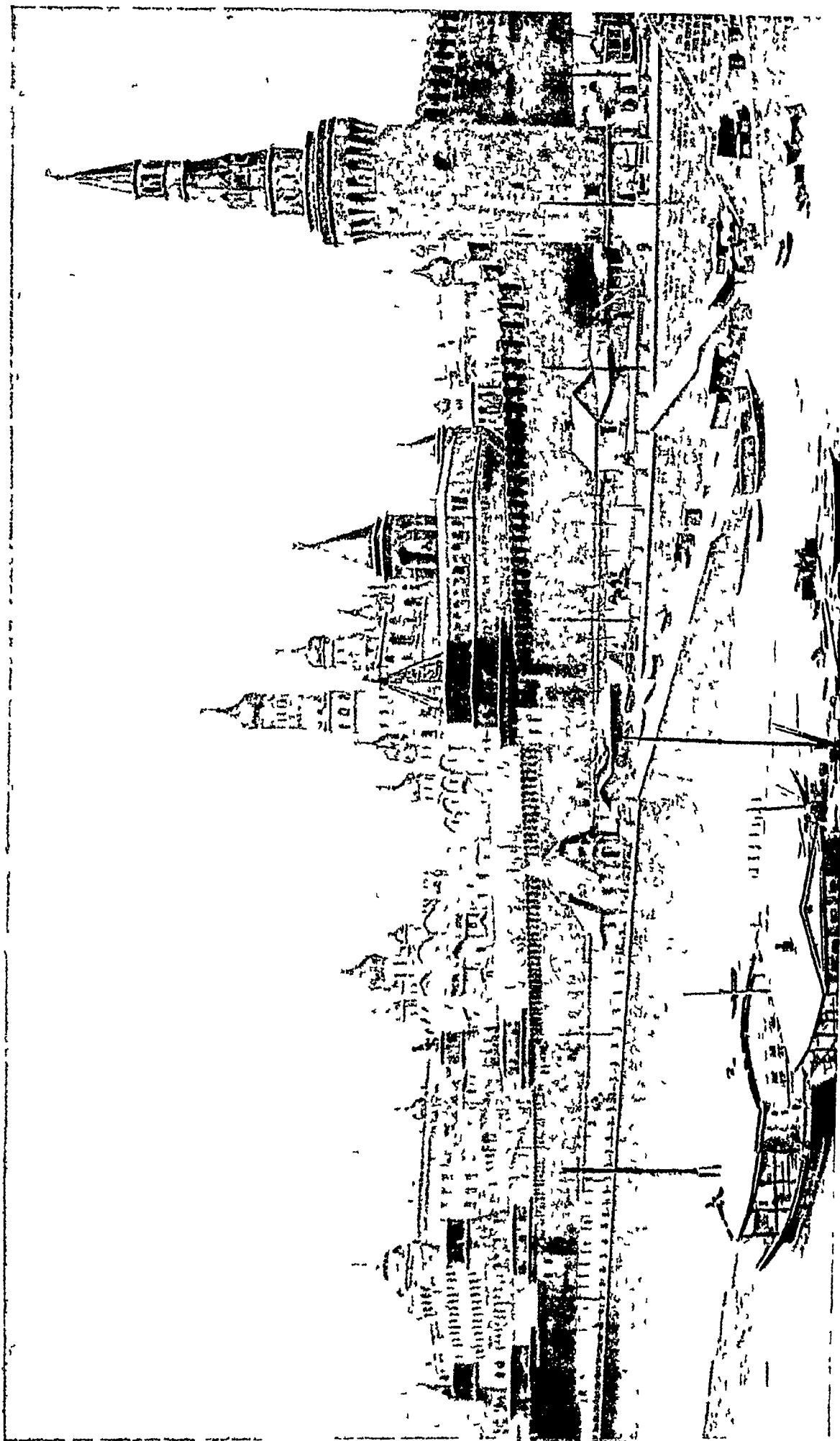
SAMOVAR AND BAZAAR IN SOVIET RUSSIA



What could be more delightfully rural than the picnic party seen in the upper photograph? The peasants gathered around the samovar are Karelians inhabitants of an autonomous republic in the north-west of Soviet Russia, and they are making the most of the short northern summer. The lower photograph shows the interior of a carpet bazaar in Merv, a prosperous town of the Turkoman S.S.R. This Soviet republic is world famous for its carpets, as well as for a special breed of Turkoman horses. Merv, ancient centre of wealth on the trade-route between East and West, is on the Transcaspian railway.

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Photos top E.N.A. bottom M.O. Williams



WALLS AND SPIRES OF THE MIGHTY KREMLIN, SEAT OF THE SOVIET GOVERNMENT

Here, from the frozen Moscow river, are seen the great ramparts and the many cupolas of the Kremlin, silhouetted against a leaden sky. Palace of the Tsars until Peter the Great moved the Russian court to the newly-built city of St. Petersburg early in the 18th century, the Kremlin is now the seat of the Soviet government. Within the walls are chapels, palaces and two cathedrals, none of which is now used for its original purpose.

Topic

and twice Prime Minister of Britain, recorded his long and eventful life

The most exciting part of the story occurred in 1832—the year of the great Reform Bill. The Tory Duke of Wellington had been forced to resign as Prime Minister. The Whigs (Liberals) then came into power with Earl Grey as Prime Minister. Lord John Russell was given the task of championing the measure which did away with the “rotten boroughs” (where few or no people lived) and gave representatives to the new manufacturing cities.

The Bill also increased very modestly the number of people who might vote. The House of Lords rejected it. In the meantime, the greatest excitement prevailed in the country. Elections were held, and mobs demanded “the Bill, the whole Bill, and nothing but the Bill.” Finally, the Lords were forced to yield.

Russell was Prime Minister from 1846 to 1852 and again from 1865 to 1866. In 1861 he was made Earl Russell, and retired from the leadership of the Liberal party in 1866 in favour of William Ewart Gladstone (qv).

RUSSIA under TSAR and SOVIET

The country of a great experiment—such is Russia, to which all people look with anxiety since the success or failure of the experiment may affect Man's whole future. It behoves everyone to study Russia carefully.

Russia. (UNION OF SOVIET SOCIALIST REPUBLICS) Stretching across the top of Asia, and occupying nearly all of eastern Europe, is the vast territory which comprises the new Russia—the Union of Soviet Socialist Republics. With an area of about 8,240,000 square miles it occupies more than one-seventh of the land surface of the whole globe. The old Russian Empire of the Tsars was only slightly more extensive.

The old Russian Empire included, in addition to the territory comprising the present Soviet Union, Finland, Estonia, Latvia, Lithuania, Poland, and Bessarabia. There were roughly four main divisions of the Empire—Russia in Europe, the Caucasus, Siberia, and Russian Central Asia. The keystone of the whole huge structure was Russia in Europe.

The Russian Empire fell to pieces in the chaos that followed the Revolution of 1917. Finland, Estonia, Latvia, Lithuania, Poland, the Ukraine, Georgia, Azerbaijan, parts of Siberia, and other regions broke away. The name “Russia” attached to the region of which Moscow was the nucleus—a territory about a quarter the size of the old empire, but still many times the size of the next largest European country. Russia acknowledged the independence of Finland, the Baltic countries, and Poland, but other states tended to gravitate

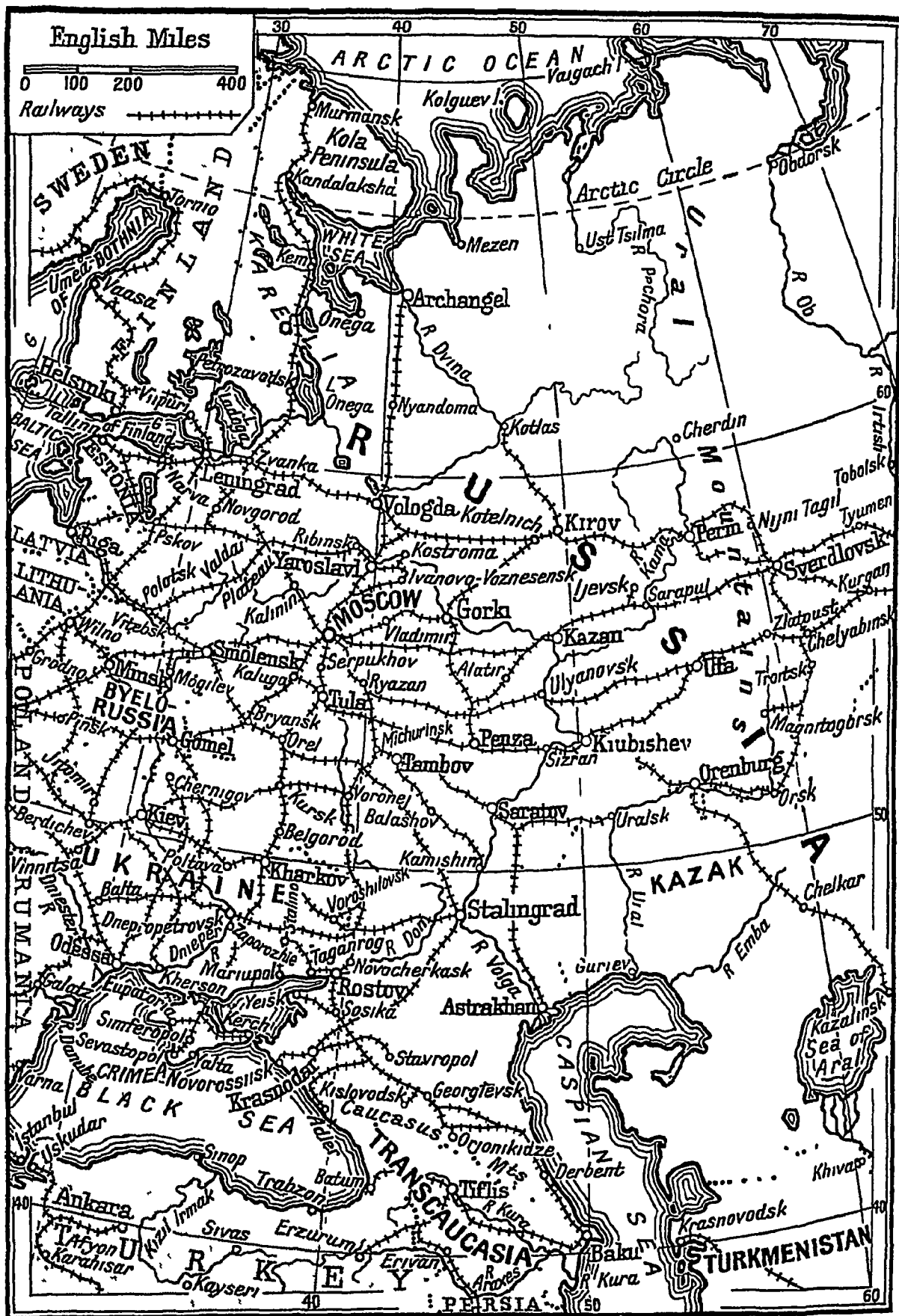
Extent (including Asiatic territory)—E to W, greatest distance, about 6,500 miles, N to S, about 2,400 miles. **Area**, about 8,240,000 sq. m. **Population**, about 193,000,000. **Soviet States**—Russian Soviet Federal Socialist Republic (R S F S R) and the Ukrainian, Western Ukrainian, White Russian, Western White Russian, Lithuanian, Latvian, Estonian, Moldavian, Azerbaijan, Georgian, Armenian, Turkoman, Uzbek, Tajik, Kazak, Kirghiz S S Republics. **Physical Features**—Caucasus, Ural, and Yaila mountains, Pamir Plateau. **Rivers**—Volga, Dnieper, Don, Dvina, Ural, Dniester, Pechora, Ob, Yenisei and Lena. **Lakes**—Ladoga, Onega, Ilmen, Balkhash, Baikal, Aral and Caspian Sea. **Products**—Wheat, rye, oats, barley, millet, maize, potatoes, horses, cattle, sheep, goats, pigs, coal, peat, petroleum and petroleum products, iron and steel, manganese, copper, chrome, gold, platinum, asbestos, timber, wood pulp and paper, chemicals, textiles, machinery, cement, furs, hides, fish, meats, eggs, sugar, glass, rubber, and matches. **Chief Cities**—Moscow (R S F S R), capital, population 4,137,000; Leningrad (R S F S R), 3,191,000; Baku (Azerbaijan), 809,000; Kharkov (Ukraine), 833,000; Kiev (Ukraine), 846,000; Rostov-on-Don (R S F S R), 510,000; Odessa (Ukraine), 604,000; Tashkent (Uzbekistan), 585,000; Gorki (R S F S R), 644,000; Tiflis (Georgia), 519,000; Sverdlovsk (R S F S R) 425,000.

back within the Russian sphere of influence, either as closely allied or federated republics or as integral parts of the Russian state. At Moscow in December 1922, the principal Soviet republics signed a treaty setting up the present Russian State. The republics represented were Russia Proper (R S F S R), White Russia (now Byelorussia), Ukraine and the Transcaucasian Federation. In 1924 the Uzbek and Turkoman Republics were formed, and in 1929 the

Tajik Republic was established, while by the new Soviet Constitution of 1936 the three divisions of Transcaucasia—Azerbaijan, Armenia, and Georgia—and the Kazak and Kirghiz areas became separate Soviet Socialist Republics within the Union. Many of these Union republics contain autonomous (self-governing) republics and regions.

The flatness of Russia and the huge scale of its plains, rivers, lakes, and forests distinguish it from the smaller, more varied countries of western Europe. Its watery fringe of lakes and marshes on the north and west is shared with Finland and its other western neighbours. Its free economic development is hampered by difficult access to the great ocean highways. Of the four land-locked seas on which it has a foothold, the Caspian has no outlet, the exits of the Black Sea and Baltic are commanded by other countries, while Archangel, the port of the

FAR-STRETCHING PLAINS OF EUROPEAN RUSSIA



The western portion of the Soviet Union before the invasion of Poland and Finland in 1939. European Russia, alone, excluding the vast expanse of Russia in Asia, has an area twelve times as great as that of the British Isles. The total area of the Soviet Union is over 8 million square miles, nearly forty times the size of France, and its population is estimated at over 193 million people.

RUSSIA

White Sea (an arm of the Arctic Ocean) is ice bound for most of the year. Curiously enough, the "Murmansk Coast" of the Arctic, although 300 miles farther north than Archangel, is so warmed by currents that it is always ice free.

Russia's great rivers to some extent compensated for its failure to reach open seas. The main water-parting is the low plateau called the Valdai Hills, about 200 miles south of Leningrad, where rise the vast highway streams of the Don, the Dnieper, and the Volga. Canals connecting the great river systems, many of them of recent construction, make it possible to pass by water from the Black Sea or the Caspian Sea to the Baltic, and from the Caspian all the way to the Arctic Ocean. In mid summer, however, the volume of water in many of these rivers is insufficient for navigation, and in winter they are frozen.

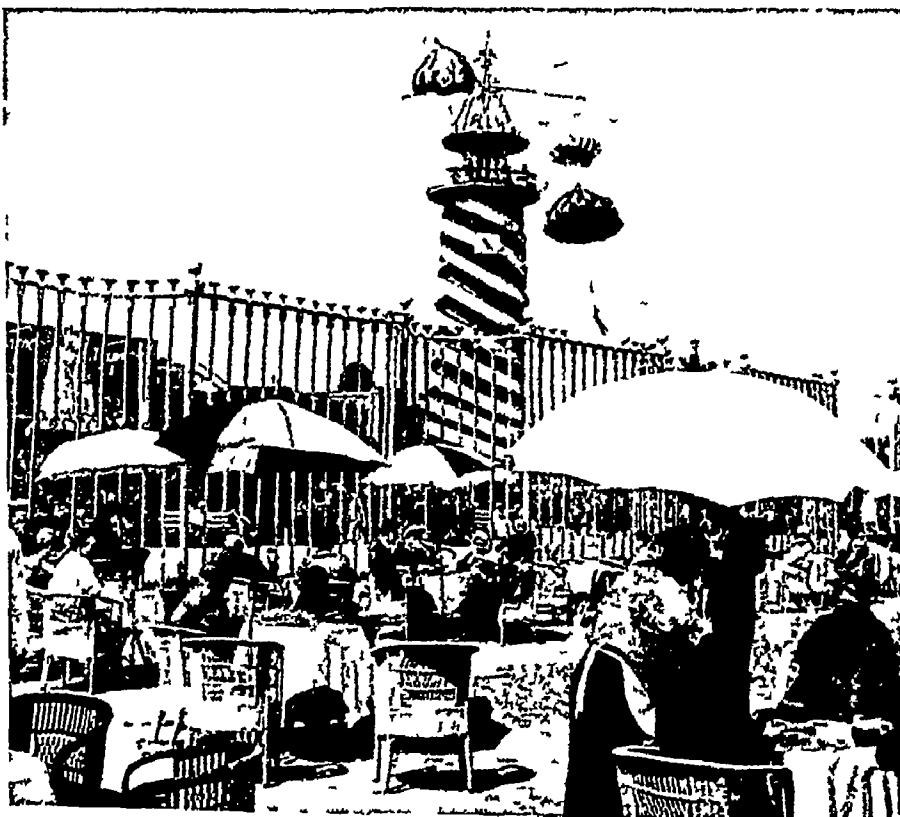
Great Range of Climate

Russia has wide extremes of temperature—long, cold winters, hot summers, scanty rainfall, and strong dry winds. At Moscow, where the mean January temperature is 14° F and the July mean 66.5° F, the mercury may rise to 100° in July. There is, of course considerable diversity of climate in a country which extends from the Arctic zone into the latitude of northern Italy. Olives and figs grow in the far south, only reindeer moss, lichens and stunted shrubs on the frozen tundras or treeless wastes of the Arctic coast.

There are, from north to south, three great belts of natural vegetation: first, the marshy tundras, then huge forests of conifers, birches, and other northern trees, and farther to the south the vast rolling grassy steppes, fertile and luxuriant on good soils, and barren on the bitter alkaline soils near the Black Sea and Caspian coasts. The immense herds of cattle and horses, and flocks of sheep which graze over the fertile steppes provide Russia with an important source of wealth. Animal and poultry products are among the chief exports.

The most productive region of agricultural Russia is the rich "black earth belt," which stretches from the Carpathians to the Urals (the physical boundary between European Russia and Siberia). Wheat from this black earth region is one of the principal commercial assets of the Soviet Union. Other important crops are rye, oats, barley, millet, maize, potatoes, sunflower, flax, hemp, and sugar beets. Cotton and tobacco are also raised.

No country surpasses Russia in natural resources, but these were exploited in only the most primitive way until the Soviet government undertook their systematic development. Old industries were expanded under the Soviet programme and new ones undertaken. Among new products were farm implements, motor cars, electric generators, chemical apparatus, and all kinds of heavy industry. Some of the enormous water-power resources were developed. The huge forest areas were worked to provide greater exports of wood-pulp and timber. Furs and fish—including the sturgeon, which gives us caviare—were shipped in increasing quantities. The Urals contain the world's chief sources of platinum and asbestos. There are also within the Union rich deposits of gold, silver, copper, lead, pyrites, graphite, phosphate, chromic ores, sulphur, salt, asphalt, mica, zinc, and potassium.



IN ONE OF MOSCOW'S PARKS

The provision of parks and open spaces for the workers is part of the plan for a new Moscow. Here is an open air restaurant in the Gorki Park of Culture and Rest, on the banks of the Moscow (or Moskva) river. In the background parachute descents, a pastime of which the Russians are very fond, are being made from the top of a tower.

Intourist

RUSSIA

salts Greatest of all are the enormous reserves of coal, iron, petroleum and peat

The fact that the great petroleum- and coal-producing centres are in South Russia made retention of these regions, or, at least, the maintenance of such relations as would ensure against hostile trade barriers, vital to the Russian State. The Donetz basin in southern Russia and the Caucasus region are the world's chief source of manganese.

The city population, always small in proportion to the vast masses of illiterate agricultural peasants, was greatly reduced during the revolutionary years. The rural regions before the War were thinly populated, and the land, as a rule, poorly cultivated. The State, rich landlords, and the Russian Church owned enormous estates, the peasant could barely keep body and soul together after paying taxes.

For several centuries a system of communal ownership of land prevailed, centring in the *mir* or Russian village community, which at certain periods redistributed the ploughlands among the family groups. This led some



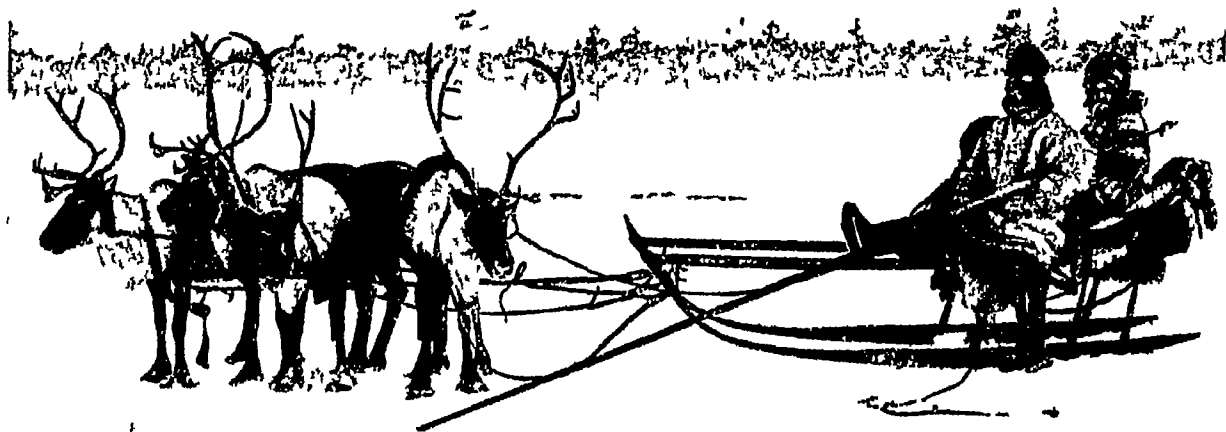
RUSSIANS OF THE FAR SOUTH

This smiling round-faced peasant woman of the Caucasus, with her bare feet half buried in straw, is preparing fodder with a rude chopping machine.

romantic-minded Russians to contrast the "holy communism" of the Russian *moujik* (peasant) with the "pagan individualism" of western Europe. In reality the *mir* was similar in its small intermixed land-holdings to the "open field" system of the medieval manor, and was a mark of economic backwardness. A moderate Russian writer on economic subjects said of the life of the peasants "It is not life, it is the slow death of creatures incessantly hungry." Potatoes were their customary food. Sometimes they added to this a thin rye soup or a little cabbage. Meat was eaten only at the greater festivals. Their

straggling villages consisted of brown wooden houses like cowsheds, ill-lighted, unventilated, rarely swept, often without beds or bed linen. Tea, which was usually only "boiled water slightly coloured," was drunk in enormous quantities. The death-rate, especially of children, was very high. The position of women among the peasants was appalling.

In 1860 the average size of a peasant land holding was 13 acres, in 1900 it had sunk to



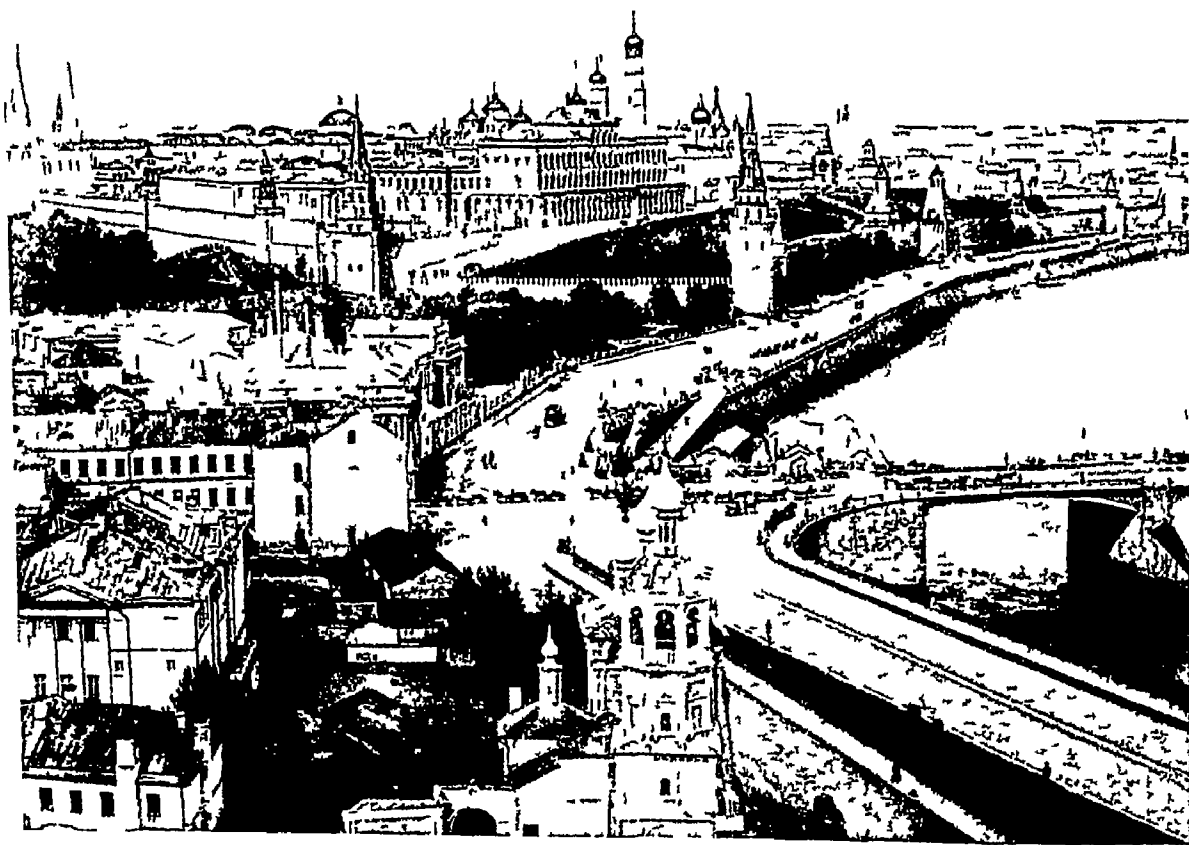
IN RUSSIA'S BLEAK SNOW-BOUND NORTH

These dwellers on the tundras of northern Russia are fishers and hunters, whose wealth is chiefly in their reindeer herds. In the distance can be seen the stunted trees of the forests of the far north.

TWO CELEBRATED CITIES OF EUROPEAN RUSSIA



Leningrad, or, as it used to be called, St. Petersburg, was founded in 1703 by Peter the Great, in order to give Russia an outlook upon western Europe. We have here a winter scene in the city. On the right, surmounted by its golden cross, is the vast dome of St. Isaac's Cathedral, one of the most beautiful and costly churches in the world, with its great rose granite columns.



'Above Moscow there is nothing but the Kremlin, above the Kremlin, nothing but the sky,' says an old Russian proverb. Looking from the Church of the Saviour (built to commemorate Napoleon's retreat from Moscow), we see on the left the towered and battlemented walls of the Kremlin, enclosing the former palaces of the Tsars, the cathedrals in which they were crowned and buried, the arsenal, and other historic buildings. On the right is the river Moscow.



THATCHED HUT OF A CAUCASUS PEASANT FAMILY

This dilapidated hut of thatch and half-plastered logs is eloquent of its inhabitants' ways of thought—the peasants of the Caucasus, who do all things in the ways of their forebears. Living in a land blessed with a bounteous soil and a genial climate, they have made but little material progress and are subject to the oppressions of poverty and evils due to ignorance.

about eight acres because population had increased despite economic conditions.

The "land hunger" of the peasants became an element to reckon with after they had been shaken out of their village isolation through army service, and had become somewhat more prosperous through the labour of peasant sons and daughters in the newly-arising factories and the prohibition of *vodka* or Russian whisky. The revolutionary movements of 1905 and 1917 originated chiefly in the cities, but after the Bolsheviks seized power the peasants were told to seize the land of their former landlords.

Being compelled to sell their produce at fixed prices, the peasants reduced their production to the level of their own necessities. Thus the redistribution of the land, while it gave some relief to the peasants, added to the general poverty and confusion.

The inadequacy of the transport facilities hampered military activities during the World War and contributed to the economic breakdown that preceded the Revolution. Vast

railway projects, the greatest of which was the Trans-Siberian Railway from Leningrad and Moscow to Vladivostok (5,435 miles), were carried through during the later years of imperial rule. But horses remained the chief means of travel in rural districts, and the poor roads were often impassable.

After 1900 the Industrial Revolution began in Russia, and large factories, producing chiefly textiles, iron and steel, railway equipment, other metal products, and beet sugar, developed in the cities, but not so extensively as to meet all the needs of the great empire, whose trade consisted chiefly of the exchange of raw materials for manufactures.



MOUJIKS IN THE HAY-FIELD

Much of Russian peasant character—patient, kindly, slow-witted, and simple—is expressed in the faces of these men in their baggy peasant costumes.

RUSSIA



RUSSIA TAKES CARE OF HER CHILDREN

The new Russia takes great pride in the physical fitness of her children and from birth careful attention is paid to their health. Here is a group of sturdy youngsters their bodies exposed to the light and air in front of a Welfare Centre near Moscow. Note the toy lorry and tractor.

Much of the internal commerce of Russia was formerly carried on at great fairs held once or several times a year at some of the larger provincial cities. The most famous was that held each summer at Nijni Novgorod (now Gorki), on the river Volga, 265 miles east of Moscow. During the fair season the city presented one of the gayest and most colourful scenes in all Europe. The population increased to several hundred thousands, and business amounted to some £20,000,000 was transacted annually. During the World War the fairs languished. They were opened in 1923, but closed in 1930.

The established religion of "Holy Russia" under the Tsars was that of the Orthodox Eastern Church, but the inhabitants of the Empire included, in addition, fetish worshipping pagans, and many Mahomedans, Buddhists, Jews, Roman Catholics, Protestants, and

members of other Christian churches, as well as such sects as the Molokani, Dukhobors, etc. The Russian peasant, though both superstitious and deeply religious, is naturally tolerant. The systematic persecution of "heretics" under the Tsars was a matter of State policy, though economic factors entered into the persecution of the Jews.

After the revolution of 1917 the Russian Church was disestablished, and priests, pastors, rabbis, and Mahomedan mullahs were excluded from all forms of educational activity, from the suffrage, from office, and from any recognition in the Soviet system. The Bolsheviks carried on an active anti-religious propaganda, realizing that religion was one of the strong forces working against their purely materialistic doctrines. In 1929, accordingly, a decree was issued prohibiting the teaching of any belief except atheism.



BATUM BOULEVARD

The town of Batum is an important port of Caucasia, on the Black Sea. Though the town is industrial, its outskirts are picturesque, as witness this photo of the Lieut. Schmidt boulevard.

RUSSIA

Although the Russians represent the most numerous of the European white peoples, Russia has been the most backward of the European countries. Her government has been continuously the most extreme type of autocratic despotism, her natural resources and economic life comparatively undeveloped, and three quarters of her population illiterate.

To the hardships of tyrannical governments have been added those of severe extremes of climate, frequent droughts, and uncontrolled floods. Moreover a vast isolation has oppressed Russia. She has been cut off from easy communication with the Western world and its influences, and within her own vast boundaries enormous distances and inadequate means of communication have kept her peoples separated in small and isolated communities. In all its vast extent, Soviet Russia has little more than 50,000 miles of railway.

A Sketch of Russia's History

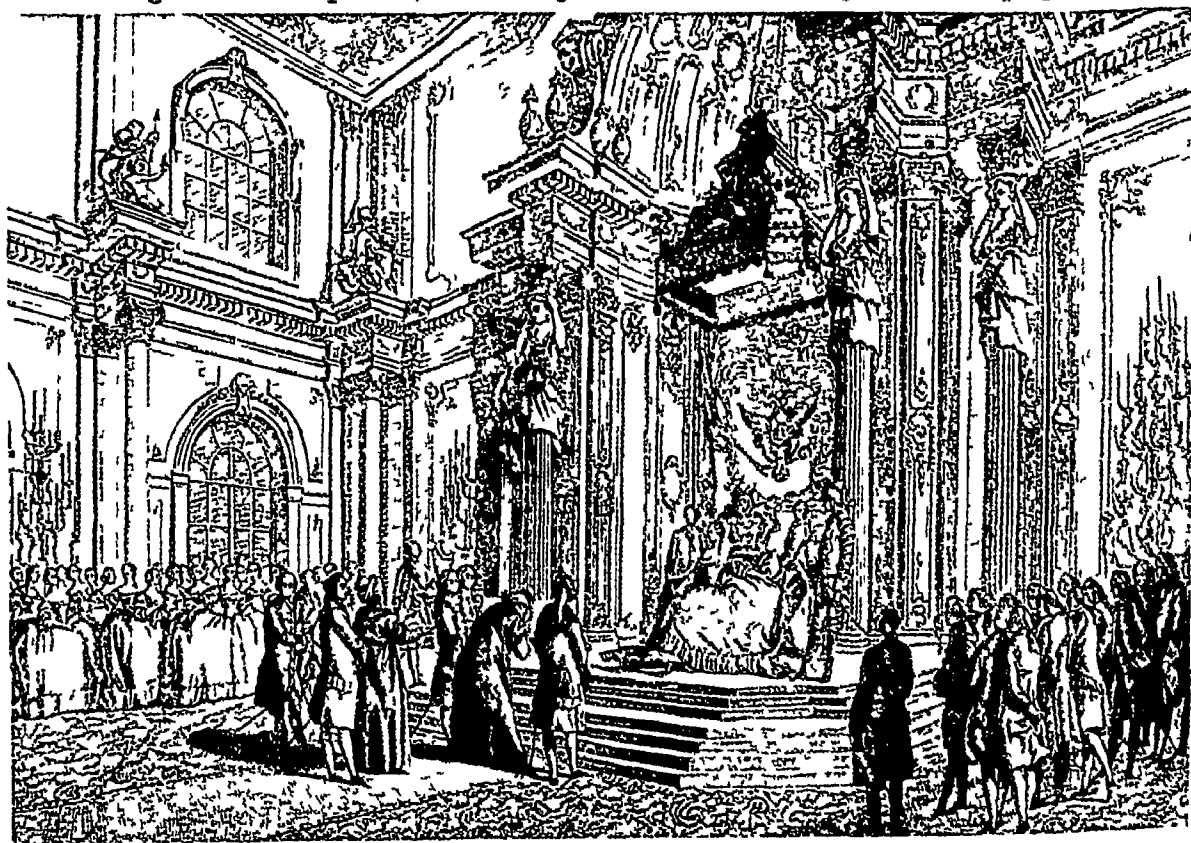
A branch of the Slavic people, who later came to be known as the Russians, settled on the western fringe of the east European plain, and gradually moved eastward, occupying and developing this vast stretch of inhospitable country, and, passing over the continent of Asia, finally reached the Pacific. This task of empire-building took many centuries, and was all-absorbing. In the process, the stronger

tyrannized over the weaker, the clever over the ignorant. The result was the practical enslavement of the great mass of the people and the institution of a purely autocratic government.

We know little about these early Russian settlers until the 9th century A.D. By that time they were settled in separate principalities on the Dnieper and the Volkhov rivers, which together formed one of the most important trade routes of the world of that day. These separate groups of Russian principalities accepted the leadership of the Grand Prince of Kiev. The Russians had adopted Greek Christianity from the Eastern Church of Byzantium (Constantinople), and culture was developing.

Invasion of the Mongols

But in the 13th century the Russian principalities were overrun by Mongolian hordes of Tartars, who came in from the east. The Russians were subjugated and forced to pay tribute to the Khan of the "Golden Horde" of Tartars. For almost 300 years the Tartar yoke rested upon the Russian people, and then, under the leadership of the Prince of Moscow, they liberated themselves. This new leader became the "Grand Prince" of Muscovy. He welded together the scattered Russian lands, proclaimed himself Tsar of all the Russias, and set about establishing and developing his empire.



AMBITIOUS EMPRESS OF 18th CENTURY RUSSIA

This engraving, after the court painter Jean de Bely, shows Catherine the Great receiving a visit of the Turkish embassy after her coronation. Her firm policy with regard to the Ottoman empire aimed at establishing Russian influence in the Levant, and in 1774 Russia obtained the right to intervene on behalf of all Orthodox Christians under Turkish rule. Her foreign policy was always directed by the desire to build up a great and flourishing kingdom.

From Brückner "Katharina die Zweite"



RUSSIAN FLEET SAILS ROUND THE WORLD TO DEFEAT

During the Russo-Japanese War, which broke out in February, 1904, the Russians were from the first unsuccessful, and both the Port Arthur and the Vladivostok fleets were quickly destroyed. Their only hope then lay in the Baltic fleet, which was making its way slowly round the world to the arena of war. It was this fleet, seen above, which on October 21, 1904, when near the Dogger Bank, fired in error on some British trawlers, sinking one of the little vessels and killing several members of the crews. When it reached the East, the Russian fleet was destroyed in Tsushima Strait in May, 1905.

At the beginning of the 17th century Russia passed through what is called her "Time of Troubles." Economic distress, caused by constant wars, had led to the breaking down of all authority, and anarchy prevailed. Her jealous neighbours on the west, Poland and Sweden, tried to profit by these troubles, but again a national awakening came, with the accession of Michael Romanoff (ruled 1613-1645), founder of the Romanoff line, and the "foreigners" were promptly driven out of public affairs.

Reign of Peter the Great

Towards the end of the 17th century Peter the Great (tsar 1689-1725), assumed power and with him the modern period of Russian history may be said to begin. (See Peter the Great.) He wanted his country to be more European—that is, more cultured and developed. Through long and difficult wars he struggled to get control of the outlets to the great Russian plain on which his empire rested. By violent changes he succeeded in modernizing his administrative machinery, he also organized a modern army, and forced education upon his officers and the members of his Court. He required all men to register for service in his Army, or for the building of canals and roads, for service in his new capital at St. Petersburg (Leningrad), or for work in the factories, which he was the first to introduce into Russia. Those who would not or could not do any of these things were heavily taxed.

Peter's work survived a half century of incompetent rulers, after which there came to the throne Catherine II, the Great (ruled 1762-1796), who took up again the task of reform. By 1800 Russia had become established as a modern state.

During the centuries of struggle the peasants, who represented the overwhelming majority of the people in this agricultural country, had been burdened with so many taxes to the State, and payments of money and labour to private owners

of land, that their status had become that of serfs. They were not slaves, but they were not free, being "attached to the soil" and to the individual landlords, whom the State thus set up in order to use their services in the Government and Army. The first task of internal reform was, therefore, to make the lot of the peasants easier.

Alexander I (tsar 1801-1825) had radical and progressive views of reform. He had already begun to carry them out when Russia became involved in the Napoleonic wars. Reform was then abandoned, and both Alexander and his successor, Nicholas I (tsar 1825-55), were driven into a panic by the revolutions in Europe, and devoted their attention to protecting Russia against what they considered the corrupting and perverting "western" ideas.

For 40 years, from 1815 to 1855, Russia made little progress. All suggestions tending towards admitting the people to a share in the direction of public affairs were ruthlessly suppressed, though these suggestions had at the beginning of the century come from the ruling monarch himself. Then in 1853 Russia became involved in the Crimean War, in which she was completely defeated by Turkey, aided by England and France.

Reforms Followed by Repression

Before the war was over, a new monarch, Alexander II (tsar 1855-1881), came to the throne. He brought the war to a conclusion as quickly as possible, and then announced that reform was to be the order of the day, and that it was to begin with the emancipation of the serfs. The Act of Emancipation, issued in March, 1861, gave liberty to some 40,000,000 serfs, and other reforms followed.

When an attempt on the life of the Tsar was made by an individual acting on his own account, however, the anti-reform leaders prevailed. Under their influence Alexander II curtailed many of the reforms already started,

and allowed others to be carried out only in form. Such repression bred more revolutionary sentiment, which culminated in the assassination of Alexander, March 13, 1881. He was succeeded by his son Alexander III (1845-1894), who simply continued his father's policy.

The Last of the Tsars

In 1894, upon the death of Alexander, Nicholas II (1868-1918) succeeded to the throne. He proved to be a man of limited outlook, though possibly of good and kindly intentions. He believed implicitly in the divine origin of his autocratic power, and called the petitions for very moderate changes "senseless dreams."

In 1904 Russia and Japan went to war over a dispute respecting rights in the Far East. The war was not popular in Russia, and when defeat, largely arising from the corruption and incompetence of the Government, met her armies, and the war was concluded on terms most disadvantageous to Russia, the revolutionary movement began again. A factory-labouring class had now arisen, and it was organized for action by Socialists and revolutionists. Peasants sympathized and gave their support. There were mutinies in the Army and Navy. In this emergency progressive manufacturers and landlords demanded measures of reform which would satisfy the just demands of the workmen, peasants, and soldiers. Partially successful, they secured at last an elected representative national assembly called the Duma, which assembled in May, 1906, but lasted only two months. The second Duma had a similarly brief existence, but the third lasted from November, 1907, to 1912.

Effects of the World War

The summer of 1914 saw fresh manifestations of discontent in Russia. In this atmosphere of unrest came the news of the outbreak of the World War (*q v*). To a small group of progressive thinkers it was no surprise. The relations between Russia and Germany, and between Russia and Austria, had long been strained.

Russia felt the crushing burdens of the war sooner than other countries. Her economic backwardness, and particularly her poor means of communication, made her war efforts very costly. She was subjected to a blockade almost as effective as that against the Central Powers, and Russia had always depended more largely than they upon foreign supplies.

In this crisis the Government proved itself incompetent and corrupt, as so often before. The most progressive men of the country came forward with offers of assistance to the Government, but their offers were rejected. Great military disasters came to Russia as the result of the failure of the Government to supply and equip the armies. The Tsar interpreted all demands for reform as either groundless or

definitely unpatriotic. By 1916 the food situation had become critical, and prices of manufactured goods had risen to absurd heights. Again attempts were made to secure political changes, but without success. In March, 1917, a food shortage in Petrograd caused riots, and the soldiers went over to the people. The Duma organized a temporary provisional government, which was representative in character, and sent a delegation to the Tsar demanding his immediate abdication. The Socialist members of the Duma organized a council of deputies from the workmen and soldiers of Petrograd.

Revolution and Abdication

This council or "Soviet" (as it was called in Russia) co-operated with the Duma committee in the selection of this first revolutionary Government, and in drawing up its programme. Nicholas II abdicated for himself and his son (March 15), and was put under arrest.

This revolution of March, 1917, was accomplished within a week. The former Government machinery in Petrograd collapsed utterly. The rest of the country, and particularly the Army, promptly submitted to the new authority. There was little bloodshed, and the revolution was hailed with joy throughout Russia. For a time the Government was in the hands of the non-Socialist Constitutional Democrats, but in July, 1917, the power passed to Alexander Kerensky, who held moderate Socialist views.

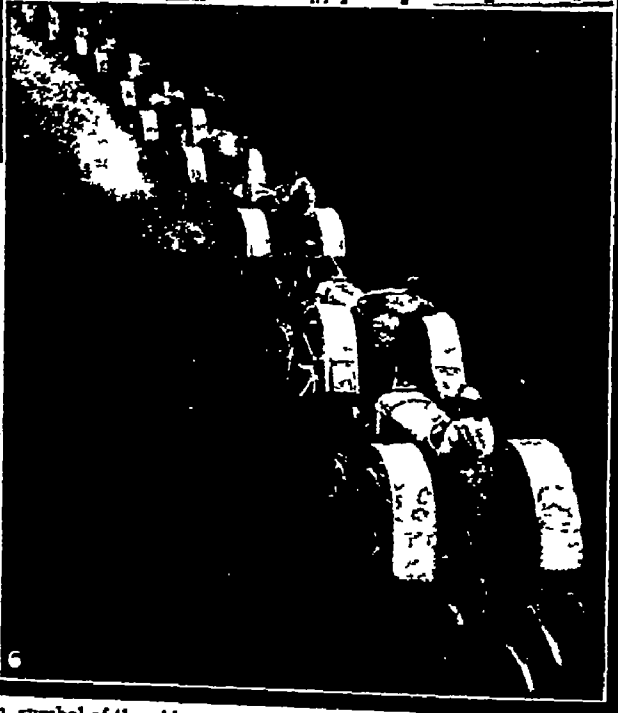
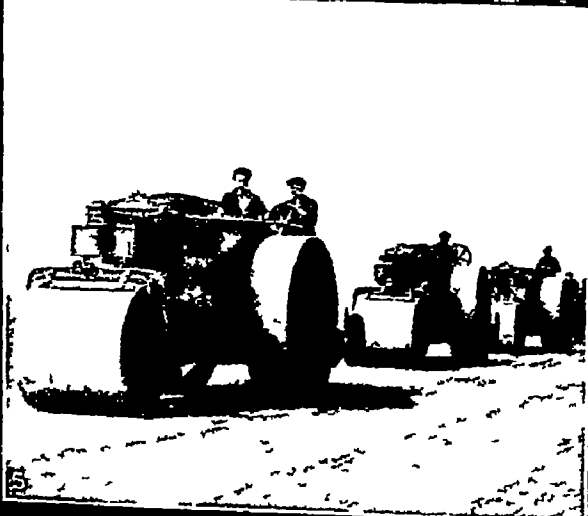
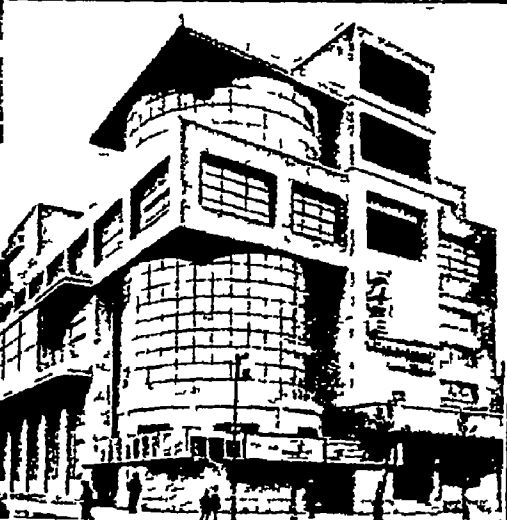
At this point there came forward a small group of extreme Socialists, to many of whom the recent revolution had given the opportunity to return from exile. They urged withdrawal from the war and a new revolution of another kind, a social revolution, the aim of which was to overthrow completely the existing social and economic system and establish a new order based on the principles of Communism. This kind of revolution would abolish all private property, and establish a dictatorship of the proletariat or workers. Its instrument was to be the "Soviet of Workmen's, Peasants' and Soldiers' Deputies," which had been organized throughout the country on the model of the one established in Petrograd at the time of the first revolution in March.

Triumph of the Bolsheviks

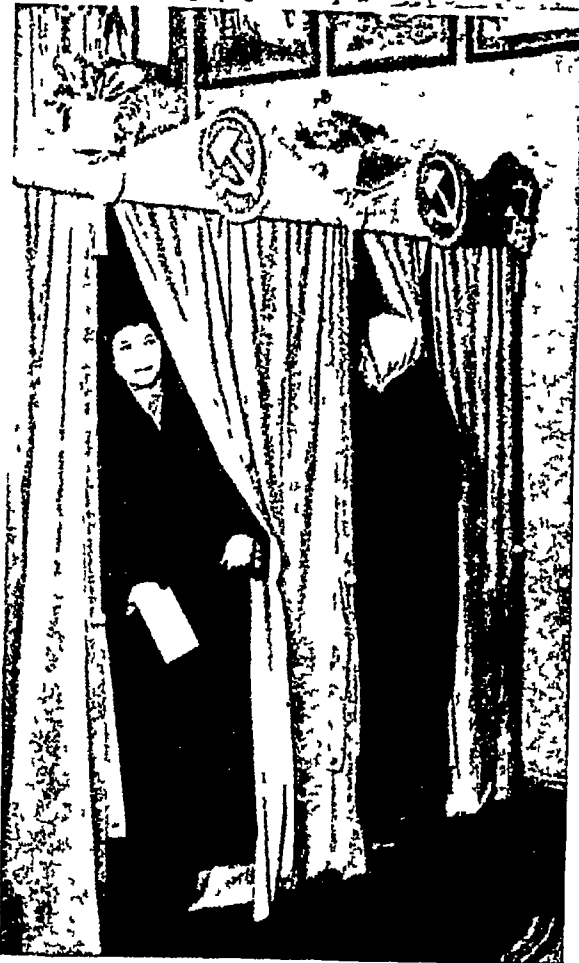
During the summer of 1917 the champions of this new revolution—the Bolsheviks as they were called—carried on active propaganda among workmen, soldiers, and peasants. They promised peace by the immediate withdrawal of Russia from the war, and to the peasants land by confiscating landlord estates, and bread to the workmen by seizing the factories. Finally, on November 9, the Bolsheviks overthrew the provisional Government.

Riots, assassinations, and measures as autocratic as any in which the Tsars had indulged

LIFE UNDER THE COMMUNIST SOCIAL SYSTEM



1 On one side of the Moscow River in Moscow glitters the Kremlin, symbol of the old regime. On the other rise these huge apartment houses for the employees of central government institutions 2 To the Communists the holiest spot in Russia is the tomb of Lenin, built of stern granite, in the Red Square, Moscow Thousands file past the body daily 3 Hot dinners are served in the fields to peasants on a communal farm in Uzbekistan, from a severely efficient travelling kitchen. 4 Workers must play as well as work, according to Communist doctrine. This communal workers Trade Union Club, of strictly modern design, in Moscow, is one of many such recreational centres for the entertainment of the working class The programme includes films, lectures, wireless entertainment, music, and dancing 5 These great rollers are giving Russia a network of good roads 6 The Soviet regime has always glorified the machine, particularly the powerful tractors which speed up agriculture on the state and co-operative farms



SOVIET GENERAL ELECTION

In the lower photograph we see women electors recording their votes in polling booths at Moscow during the first Soviet parliamentary election in 1937. The upper photograph shows an election canvasser urging women of the Armenian Soviet Republic to go to the poll.

Photos Planet News

were used to further the purposes of the Bolsheviks. The new Government which they set up was called "the Russian Socialistic Federated Republic of Soviets." Eight months later the former Tsar and his whole family were brutally shot dead at Ekaterinburg (now Sverdlovsk) by the Ural regional Soviet (July 16, 1918).

In March, 1918, the Treaty of Brest Litovsk, entailing a separate peace between Russia and the Central Powers, was drawn up and signed. The Bolsheviks then set about carrying out their revolutionary programme. Those that opposed them—even by force of arms—also opposed the peace with Germany which they had signed. On this basis the Allies and America rendered assistance to the anti-Bolshevist movements. Civil war was rampant in Russia for two years, and Trotsky, Lenin's lieutenant, organized a strong Red Army to stamp out rebellion. The Allies sent out assistance to the anti-Bolshevist Volunteer Army, landed a small detachment on the Murman coast, and occupied the port of Archangel and the oil centres of Transcaucasia. In Siberia, Admiral Kolchak established a "White" dictatorship, and advanced into European Russia. Help promised from the Allies never came, however, and he was captured and shot.

The Communist Party, which included at this time only a little more than one per cent of the total population, now became the only political organization permitted. It constituted in fact a dictatorship in the name of the working class. The State was federal in organization. Non-Russian national minorities were

ANCIENT AND MODERN MEET IN RUSSIAN LIFE



Under posters that urge workers to speed up production, two bricklayers sit eating their black bread and soup in the communal kitchen at Magnitogorsk the great new city which has sprung up in the heart of the iron fields in the Urals

Photo Margaret Bourke White

given independence or autonomy within the Union, with freedom to use their native languages and develop their peculiar national cultures. But the principle of nationality was subordinated always to that class. The Communist Party dominated everything, and Russia proper, centring in Moscow, continued to be the ruling member of the Union.

The governmental organization of the Soviet State today is built like a pyramid. At the bottom are the local soviets, designed to represent the productive life of the country directly. Each village soviet sends delegates to a township soviet, which elects an executive committee with full administrative power within its jurisdiction. Likewise, deputies from industrial areas assemble in the city soviets. Deputies from village and city meet in district and provincial soviets, and so the pyramid mounts, reaching its pinnacle in the Supreme Council of the U.S.S.R., which exercises legislative authority over the whole State. Between sessions this authority is vested in the Presidium of the Council. The chief executive and administrative organization is the Council of Peoples' Commissars, or Cabinet. There is a similar scheme of government in each of the constituent republics and provinces.

Lenin's Successors in Leadership

Nikolai Lenin (*qv*), the original leader of the Revolution, died in 1924, but his assistants carried on in his name and followed his teachings. Most prominent of the leaders after Lenin were Leon Trotsky (*qv*) and Josef Stalin (*qv*). These strong and forceful personalities clashed temperamentally and also over policy. Stalin, "the man of steel," emerged victorious. Trotsky was arrested and exiled, while Stalin became the leader and practical dictator of the Communist state.

The early years of the Soviet regime saw a complete break-down of industry, transport, and agriculture. By 1921 the whole nation faced starvation, and the Government was forced to adopt the "New Economic Policy" (N.E.P.). This involved dropping many Communist principles. Money, which had become practically worthless, was reintroduced, and put on a gold basis; private trading was allowed within certain limits, and the wage system was restored. Industry revived, and many people believed these changes would end "the Russian experiment."

But the Government was only waiting until it felt strong enough to resume its programme. Year by year its forces were strengthened as the younger generation grew up, trained in Communist principles by the schools. By 1928 it was ready to renew the drive for Communism. After banishing Trotsky, who clung to the idea of working for "world revolution," the Stalin

Government set itself to reorganizing Russian agriculture and industries on Communist lines.

The First Five-Year Plan

Stalin's programme, started in 1928 as the first "Five-Year Plan (N.E.P.)," called for creating mines, mills, factories, and transport sufficient to enable Russia to produce all the materials and machinery needed to build a complete "machine age" civilization. The entire country was mobilized behind this programme, and the political police (Ogpu) ruthlessly suppressed all objectors. But great difficulties had to be overcome. Foreign machinery and foreign experts were needed, and had to be paid for. Russia's only chance to pay lay in exporting raw materials, principally foodstuffs. This meant that the peasants must produce a surplus, even though they were not producing enough to feed themselves and the rest of the country.

Huge "state farms" were established under Government management. Other peasants were encouraged to "pool" their land and belongings into "collective farms" which the Government undertook to supply with machinery, good seed, and live-stock. The *kulaks* (richer peasants) were driven from their farms, and many were banished to distant lumber camps.

Production was slow in increasing. The Government took a large share of the crops, and the discontented peasants retaliated by planting smaller crops, letting weeds run wild, butchering their live stock, and by other methods of passive resistance.

The city workers felt the pinch even more than the peasants. Under the Communist plan, every city worker had a food card, entitling him to obtain supplies at Government stores. Factory workers and members of the Communist Party obtained the most generous rations. If others wanted to increase their scanty rations, they had to buy in "open markets" where the N.E.P. permitted peasants to sell any surplus they managed to produce. But now there was no surplus of food for sale. Supplies of clothing and other "consumers' goods" were also insufficient.

In 1931 the original Soviet plan of paying all workers the same wage had been changed to payment according to skill and output, and the five-day week adopted at first was changed to six days, with the same day off for everyone. Thus each worker could be kept at the same machine and held responsible for it.

The Second Five-Year Plan

In 1933 the Government announced a second Five-Year Plan, designed especially to improve living conditions. Production of industrial plant was to be slowed down and more goods produced for the consumer. After two large harvests, restrictions on the sale of foodstuffs

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were removed, food cards were abolished, and prices were reduced. This was followed in 1937 by a third Plan.

Production in many lines was greatly increased. Russia became an exporter of cotton instead of an importer, and regained its position as the world's largest producer of manganese. It was second only to the United States in its output of pig iron. Coal, iron, steel and oil production ran well ahead of the five year schedule. A programme of railway building was begun, to extend and modernize the old, inadequate and inefficient system. The 1,700 mile "Turksib" line was completed.

Of recent years Russia has done much to develop that part of her territory which lies within the Arctic Circle, and in 1937 there began an intensive opening up by aeroplane and ice breaker of the regions round the Pole.

Great emphasis was laid on education and culture. Primary and high school education was made compulsory for both sexes. Museums, libraries, concert halls, reading rooms, and clubs were established in ever increasing numbers. Drama and opera at Moscow were developed to an unusual degree of excellence. The number of newspapers, books, and magazines increased. Both wireless and the cinema were actively promoted by the Government as instruments for spreading Communist propaganda throughout the country.

The new Constitution drawn up in 1936 contained many features of democratic government while retaining a strong central executive. A new legislature was introduced, consisting of two Chambers—the Union Council and the Council of Nationalities, forming the Supreme Council.

Relations with other countries were long disturbed by the world wide revolutionary activities of the Third International. They improved slightly, however, when Russia joined the League of Nations in 1934, though the frequent trials of prominent men for "plotting against the State," and Russia's intervention in the Spanish Civil War, caused other nations to distrust her policy. Treaties with France and Czechoslovakia bound each to aid the other against any European aggressor.

But a double menace threatened Russia's

far-flung frontiers. On the west, Germany's dictator Hitler openly coveted the rich territory of the Ukraine. On the east, Japan's aggressive activities in Manchukuo and Mongolia brought frequent armed clashes along the Soviet frontier which might easily lead to war. Fearing simultaneous attack in Europe and Asia, Russia slowed up parts of the Five Year Plans in order to rearm. Tractor factories turned to making tanks, huge fleets of fighting planes were built, and the Red Army was increased to a strength of more than a million men. In August 1939, Russia signed a non aggression pact with Germany, and after Germany had invaded Poland from the west, Russia (on September 17) recaptured in the east all the territory she had lost to the Poles in 1920. The Russian Government then proceeded to exact new military ad-

vantages from Estonia, Latvia and Lithuania. Similar demands to Finland proving of no avail, Russia invaded that country on November 30, 1939. A peace was signed (March 12, 1940) by which Russia obtained a large area on Finland's eastern frontier and other concessions of strategic importance. In August, Estonia, Latvia, Lithuania and Bessarabia were incorporated into the Union as Soviet Republics.

Russia: ART AND ARCHITECTURE. Cut off, as she was until comparatively recent times, from the civilizing influences of Western Europe, Russia developed by

herself a very distinctive style in both painting and architecture. Thus, although most of the finest buildings of the old Russian Empire were erected after western influences had begun to be felt, the features which are most characteristic of the national style are to be seen in the earlier churches. The famous church of St Basil in Leningrad shows this well enough, its bulbous domes being due to the influence of Byzantine Christian missionaries.

A western style that had considerable influence was the baroque, whose picturesque ornamentation appealed to the Russian mind. In the time of Catherine the Great the classic style took its place, and Roman and Greek models were used right into the 19th century. After the revolution, architecture gradually settled down into a style in which attempts



REPOSITORY OF RUSSIAN ART

The Tretyakov Art Gallery, Moscow, the entrance to which is seen above, houses nearly 24,000 exhibits by Russian artists. The huge bust is of Nikolai Lenin.

RUSSIA

were made to get away from all precedent and create something new, simple, and almost purely functional. Reinforced concrete is the principal material, often coloured red and grey,



TYPICAL RUSSIAN ICON

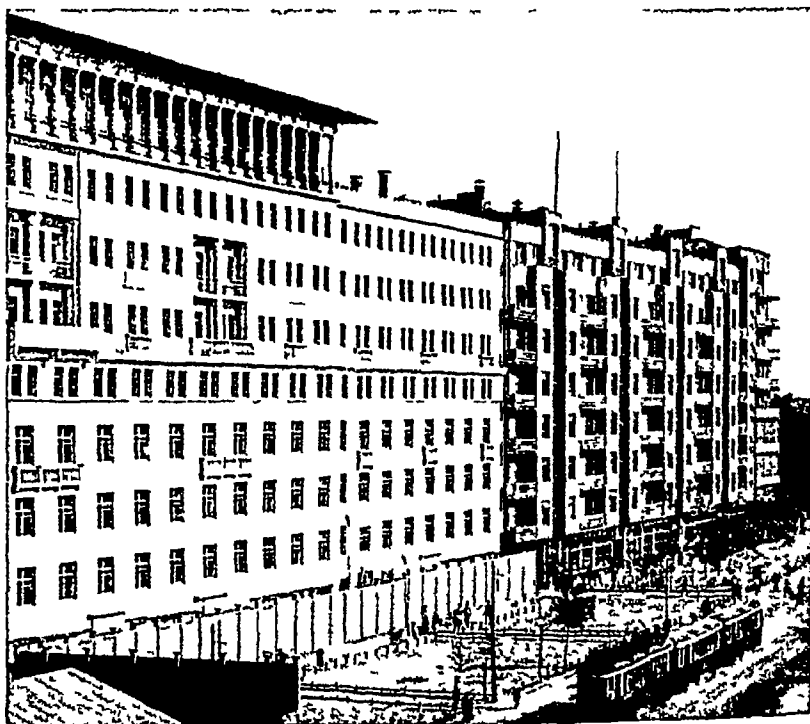
In the Eastern Church the icon is a sacred portrait, either a flat painting or in very low relief, since sculptured figures are forbidden. They are often of painted metal. The one above depicts St. John the Baptist.

Stroganovsky, which endured up to the time of Peter the Great. With him so much western influence appeared that the art fell into disuse.

Later still, as, for example, in the 18th and 19th centuries, foreign painters working for the

and ornament is confined to the hammer-and-sickle emblem of the Soviet.

Russian painting, like the architecture, is traceable largely to the religion of the country, for the only artists in the earlier days were the makers of the icons (small holy portraits) which play so important a part in the ritual of the Orthodox Russian Church. The style of these came, with the religion itself, from the Byzantine Empire, but gradually it changed and became more and more national, influenced from the Balkans and Greece. The Novgorod school of the 14th and 15th centuries produced the finest works of Russian art of this kind, culminating in the work of Andrea Rublyov (1370-1430), Russia's greatest master. Later than this were the schools of Moscow and



CHANGING STYLES IN SOVIET RUSSIA

The photograph, upper left, shows the Church of the Blood, in Leningrad. It is a late 19th-century church, showing a motley collection of styles and inferior imitations of ancient Russian forms. In contrast the lower photograph shows a block of flats of the type which is replacing the former squalid dwellings of Moscow's workers.

imperial court were more important than the native artists, some were French, others German, Dutch, or Italian, a few English. Gradually, however, in the later days of the Empire, there sprang up in Russia representatives of all the schools found elsewhere in Europe—romantics, classicists, and realists. The Russian ballet, especially under Diaghileff, provided opportunities for many fine scenic and costume artists, of whom Leon Bakst (1866–1924), Alexandre Benois, Larionoff and Nathalie Gontcharova are the best known, while another Russian, Boris Anrep, has been responsible for the mosaics in our own National Gallery. Amongst moderns, an outstanding Russian is the former Expressionist, Kandinsky, but these last artists have all worked outside Russia, since the present regime makes individual effort and reputation impossible.

Russian Literature.

Born under the yoke of a monstrous tyranny, the master writers of the 19th century—the golden age of Russian literature—were compelled from the first to struggle against ignorance, superstition, and persecution. If they painted too vividly the sufferings of the peasants, the corruption in official circles, or the leaden weight of the Russian Church, they were in danger of imprisonment and exile to Siberia.

Yet this attitude of the Government merely gave a keener edge to social and political questionings, and sharpened the pens of the writers with a more bitter satire. It thus prepared the way for the Revolution of 1917, which dethroned the Tsar.

Russian is considered, next to Chinese, the most difficult tongue for foreigners to master. Its grammar is intricate, and it is written with the Cyrillic alphabet, derived in the 9th century from the capital letters of the Greek alphabet, with the addition of several arbitrary characters. There are three branches in the Russian group of languages: (1) Great Russian, spoken in the north, central, and east, which was the official language of the whole Russian Empire; (2) Little Russian, the language of the Ukraine in South Russia; and (3) White Russian, which merges into Polish in the west. Of these, Great Russian alone has been developed and enriched to the point where it has produced a truly great literature. It is chief among the Slav languages, which include also Polish, Czech,

Croatian, Bulgarian, Slovenian, Serbian, and many other tongues.

Great Russian had its origin in the Old Slavic language, which is still the official tongue of the Russian Church, and which bears the same relation to modern Russian as Latin does to French or Italian.

But in the 13th century the Golden Horde of Tartars conquered Russia, and for over two centuries froze her intellectual and artistic life, building an invisible but real wall between her and Europe. Then, as the new Russian nation formed around the Princes of Muscovy, the intolerant despotism of the new Tsardom throttled literary endeavour until the 18th century.

Russia, however, could not remain forever cut off from Europe. First from Poland, then

from Germany, and later from France and England, the wind of new ideas began to blow. Meanwhile, the versatile genius, Mikhail Lomonosov, had written the first Russian grammar and won the title of "father of Russian literature." The first voice from Russia heard outside was that of Alexander Pushkin, the "uncrowned Tsar of Russian poetry," in the 19th century.

In no field is Russian literature more notable than in that of the modern realistic novel, of which Nikolai Gogol, with his amusing pictures of the Russian country gentry, was one of the founders. Among the great novelists was Turgenev, master of realistic prose, Dostoevski, student of the human soul who has influenced all modern

"psycho-analytic" literature, and the master mind, Leo Tolstoy, at once great social reformer and penetrating artist. Master of wit and tragedy was Tchekhov, both in plays and short stories. Gorki, vivid narrator of the seamy side of life, championed the poor and oppressed. Andreyev, the eccentric but powerful mystic, wrote grim and chilling plays and tales of morbid horror.

Throughout the work of these writers may be heard the thunders of the oncoming Revolution. In the first half of the 19th century the cry of liberty and social reform came from the "intellectual" aristocrats. From 1850 to 1870 the cry was taken up by the middle class, the student element, and the "nihilist" movement began, with its appeal to reason and science. Then came the "populist" period, idealizing



PUSHKIN, ROMANTIC POET

Alexander Pushkin is one of the great figures of Russian literature. In "Eugene Onegin" he wrote a work of genius, abounding in descriptions of great beauty, in superb characterization, and in humour and tragedy of equal power.

After Von W. Tzoplin

the great peasant class of Russia. When the ignorant and superstitious peasant proved indifferent or blind to visions of a better future, a spirit of reaction and despair set in.

The '90's saw symbolism reach Russia. Alexander Blok was perhaps greatest of the symbolist poets, while Sologub produced, besides symbolist verse, one of the finest novels since Dostoevski, "The Little Demon". Biely, who also began as a poet of the younger Symbolist School, revolutionized Russian prose, notably in "The Silver Dove" and "Moscow," both novels. Associated with him in the improvement of the Russian language as a literary vehicle was Remizov.

Literature on New Lines

A large group of writers from all classes, named by Trotsky the "poputchiki," or "the Fellow Travellers," because, while not completely Communist in beliefs, they were willing to "travel along" with the Revolution, became prominent about 1921. In this year was published the first novel of Boris Pilnyak, best known of the group. Others were Ivanov, born in the Kirghiz steppes, Lydia Seifullina, a peasant woman who portrayed peasants as primitive brutes, the peasant poet, Yessenin, and Isaac Babel, whose vivid tales of the Red cavalry are the best literary work of the group. Their tendency was to great abstractedness, to movement of masses rather than to play of individual character. "Revolution" was their hero. Only partially associated with the Fellow Travellers was Leonov, more conservative both in style and subject. The Five-Year Plan gave the Russians a new abstract "hero," that of industrialization, glorified in the novels of Gladkov and Semenov.

Most Russian writing has a bitter and acrid flavour, yet there is no denying the power of its grim, exalted spirit. No writers have excelled the Russians in intensity and human insight and in vigour of expression.

Rust. Rust is really an iron ash formed when an iron surface is "burned" by the oxygen of water. You can rub off old rust in a powder as fine as ashes, and it is this iron oxide mixed with soil that gives it its brown or reddish colour. Being slightly soluble in water it is taken up and used by plants. Through water and plants, we take iron into our bodies to give us the red colour of our blood.

Neither wrought iron nor steel nor cast iron, as usually made, can be exposed to moist air without rusting. When a drop of rain falls on a clean bright surface of iron, for a short time the drop stays clear, showing the bright surface of the iron through it. But soon it takes on a greenish appearance, showing the compound formed by the oxygen in the water with the iron. Presently this compound turns reddish



GORKI, REALISTIC NOVELIST

Alexei Pyeshkov, who wrote under the pen-name of Maxim Gorki, was famous for his realistic descriptions of vagabond life, and for his play "The Lower Depths." After the Russian revolution the town of Nijni-Novgorod was renamed Gorki in his honour.

brown. This is rust. The rust does not stick to the iron, but hangs in the water, and becomes a coating only when the water has evaporated. Iron remains quite free from rust in an atmosphere containing water-vapour, so long as the water-vapour does not condense as liquid water on the surface of the iron. But when rust once forms, the iron will go on rusting in an atmosphere in which a piece of clean iron will not rust, because a rough surface aids condensing, and impurities hasten rusting. Thus it is much easier to prevent the first formation of rust than to stop the process. A piece of iron dipping below water rusts mostly at the surface of the water. Here the oxygen and carbon dioxide of the air meet the water, all three are necessary for rusting to take place. To prevent rust, oil paint is used, also a zinc coating (galvanizing), electroplating and japanning.

Rusts and Smuts. Though they are so minute, these parasitic fungi of the *Basidiomycetes* group prey upon our most valuable cereals and cause great crop losses. Wheat, oats and barley are the crops chiefly affected, but rye, beans, clover, and some of the stone fruits also suffer seriously. In addition, huge losses are caused to the lumber industry, for the rusts and smuts are found practically the world over, and attack all types and sizes of plant life.

Wheat rust (*Puccinia graminis*) feeds at different stages on two different plants, which

botanists term its "hosts" One host is the wheat plant, the other is the shrub barberry, and many authorities maintain that if the latter were eradicated, wheat rust would be conquered

On the under side of the barberry leaf we find masses of orange-coloured spores in little depressions called "cluster cups" These spores, carried by the wind for many miles, fall on the young wheat stalks, and germinate, forming a thread-like mass called the "mycelium" By appropriating the wheat's food, this filament flourishes, while its host is stunted, but not killed

Red Rust and Black

Before harvest time the crop of summer spores appears as rusty-looking lines or dots, usually upon the leaves, but sometimes upon the stalk also This is the "red rust" of wheat Scattered by the wind upon neighbouring plants, these spores quickly germinate, spreading the disease with fearful rapidity during the growing season Later in the summer "black rust" emerges upon the wheat stems as masses of dark coloured winter spores These germinate the next spring, forming a filament that produces more spores for the wind to waft to the barberry leaves, ready to begin the deadly cycle all over again

The smut fungus has a less complex history In the case of smut of wheat, oats, and barley, the spores are clinging to the seed when sown The fungus enters the seedling soon after it sprouts, grows up with it, steals its food, and usually prevents it from forming seed Instead, smeary smut masses form, consisting of millions of spores that in the threshing and handling attach themselves to the sound grains, thus endangering the next crop

Smuts are spoken of as "loose" and "covered" smuts and "bunt" Loose smut changes the spikelet into a sooty mass, which the wind blows away, leaving the stalk bare Heads affected by covered smut remain on the stalk until the harvest Bunt affects only wheat kernels, and is the most destructive of all wheat diseases, sometimes causing the loss of

half the crop The powdery mass inside the smutted grain smells like decaying fish

For the prevention of grain rusts, experts pin their strongest hopes to the development of new varieties of grain able to resist the fungus Crop rotation helps to cure rust infected soils Excess of either nitrogen or moisture favours the infection. Experiments prove that although the barberry stage is not always indispensable to wheat rust, it increases the distribution of the parasite

Ruth. In the days when the "Judges" ruled in the land of Israel—so the Bible tells us in the beautiful story of Ruth in the Old Testament—a certain man of Bethlehem had gone with his wife Naomi and his two sons to dwell in the land of Moab There he died, and later the two sons, who had married Moabite women, also died Sad and lonely, Naomi decided to return to her old home So with her daughters-in-law, Ruth and Orpah, she started out on the journey back to Bethlehem

Before they had gone very far, Naomi told her companions to return to their homes, for only grief and loneliness were in store for them if they followed her into a strange land And she said to them "Go, return each to her mother's house the Lord deal kindly with you, as ye have dealt with the dead, and with me" Then she kissed them, with many tears

And Orpah kissed her mother-in-law and went back, but Ruth clung to her and would



RUTH REFUSES TO LEAVE NAOMI

Philip Calderon's well known picture of Naomi with Ruth and Orpah, reproduced above, hangs in the Walker Art Gallery at Liverpool. It depicts the parting of the ways between Moab and Judah, where Naomi, before passing over Jordan, bade farewell to her daughters-in-law Ruth's words beginning "Intreat me not to leave thee" are among the most beautiful in all literature

Reproduced by permission of the Corporation of Liverpool

not go back "Intreat me not to leave thee," she said, "or to return from following after thee for whither thou goest, I will go, and where thou lodgest, I will lodge thy people shall be my people, and thy God my God where thou diest, will I die, and there will I be buried the Lord do so to me, and more also, if ought but death part thee and me" So Ruth and Naomi went on together, and they reached Bethlehem in the time of the barley harvest

Now, it was the custom in those days for the poor to go into the fields and pick up, or glean, the grain which the reapers had left behind Ruth went out to glean, so that she and Naomi might have food, and it so happened that she came to the field of a wealthy kinsman of her husband's, named Boaz He noticed Ruth as she gleaned among the reapers, and he asked about her

And when they told him who she was, and how she had left her native land to come to a strange place, he was deeply moved by her loyalty to Naomi He spoke kindly to Ruth, telling her to come again to his field He commanded his young men to treat her with respect, and told them to let some of the grain fall on purpose for her

Ruth returned home very happy that evening, and described the great kindness of Boaz "The man is one of our next kinsmen," said Naomi So day after day Ruth gleaned in the field of Boaz, and at the end of the harvest he "took Ruth and she was his wife" They were very happy together, and still more happy when a son was born to them They called him Obed, and in after years Obed became the father of Jesse, the father of David

Rutherford, ERNEST, 1ST BARON RUTHERFORD OF NELSON (1871-1937) The world of science lost one of its greatest leaders when Lord Rutherford, famed for his far-reaching researches in the realm of radioactivity and his ingenious theories of the nuclear structure of the atom and electrical nature of matter, died on October 19, 1937

Born and educated in New Zealand, Rutherford came to Cambridge in 1895 to work with J J Thomson for two years This led to his appointment to McGill University, Montreal, Canada, where he met Frederick Soddy, with whom he frequently collaborated Together they traced the "genealogy" of radioactive elements This gave Rutherford the first hint

of the vast store of energy in the atom After being Professor of Physics at Manchester University for four years, he put forward his theory of atomic structure in 1911, and from this he showed that the structure of matter is electrical In 1919 he became Professor of Experimental Physics at the Cavendish Laboratory, Cambridge, where he devoted much time to the artificial transmutation of elements This work led him to the view that the nucleus of the atom was itself a complex structure similar to that of the atom

Rutherford received the Nobel prize for chemistry in 1908, was knighted in 1914, and awarded the Order of Merit in 1925, in 1931 he was raised to the peerage (See also Atom and Atomic Theory, Radium and Radioactivity)

Rutland, ENGLISH CO This inland county is the smallest in England, its area being no more than 152 square miles

It consists of a fairly lofty plateau and high ridges with fertile valleys between, of which the Vale of Catmose is the district of the Cottesmore Hunt Parts of the royal forest of Lyfield remain The county is chiefly engaged in sheep and cattle-raising, wheat growing, and the making of cheese, including the famous Stilton Oakham is the county town, and Uppingham is the seat of a public school founded in 1584 The population of the county is about 17,000

Rye. In the northern countries of Europe where wheat does not grow well, rye is the principal cereal Usually rye flour contains the whole substance of the grain, and therefore is richer in protein than white wheat flour

Rye (*Secale cereale*) is a cereal grain closely related to wheat Its home was in Europe, probably in the region lying north of the Black Sea Russia, Germany, and the Scandinavian countries are the chief producers

The rye plant is too strong and wiry to make good forage for cattle, though it is grown in the south of England for this purpose Another objection to it as a forage crop is that it is subject to the attack of a highly poisonous fungus (*Claviceps purpurea*), which grows in place of the grains, and forms horny masses called "ergot" Rye is more tolerant of poor soil than the other cereals The straw is particularly valuable for thatching and also makes good litter






H. Bastin

EARS OF RYE

Rye can easily be distinguished from other cereals for the ears are more slender than those of wheat, and have much shorter "awns" than those of the barley



THERE was a time when the letter S looked more like our W. Turn the W on its side and cut off the bottom line and you get something that looks very much like our S. The story of S begins, in Egyptian picture writing, with the hieroglyph  known as the "inundated garden," representing papyrus or lotus plants growing out of the water. When it came to be written in the Egyptian running hand like this  it no longer looked like a garden, and the Phoenicians called it *Shin*, which means "teeth." If you look closely, you can see the outline of the lower teeth, and the chin and beard as well. But as the Phoenicians themselves made it  it was like a very squat W. Then the Greeks took it and, standing it on its side, made it into their letter Σ (*Sigma*). Later the last stroke was omitted and then when the Romans had rounded the points, it was our letter S. The swishing sound of water among reeds is still heard in the letter today.

Sabbath. It has been said that the Sabbath is "a festival not of one city or one country, but of all the earth." A weekly day of rest has been found among almost all nations, including the ancient Egyptians, Babylonians, Hindus, Persians, Greeks, and Romans.

Perhaps the Hebrews derived their Sabbath from the Babylonians, but, as observed by the Hebrews, it acquired new significance. It was a day of rest (the Hebrew *shabbath* means "to rest"), but it was also a holy day, a memorial of the completion of creation on the Seventh Day and of the deliverance of the Israelites from Egyptian bondage. The Hebrew Sabbath is the seventh day of the week (our Saturday), and it lasts from sunset on Friday to sunset on Saturday. During this time all ordinary labour must cease.

Among Christians, the first day of the week, as the Lord's Day, the day of Christ's Resurrection, early came to be regarded as more holy than the Hebrew Sabbath, and so Sunday came to supersede Saturday as a day of rest as well as a day of worship. The Church transferred many features of the Jewish Sabbath to Sunday and designated that day as the Sabbath. However, there are some Christian sects which today observe the seventh day.

Sago. The sago of our puddings has travelled far before it arrives on our dinner-table. It is obtained from the starchy soft inner portion of the sago palm, and the world's supply comes from the Straits Settlements and the Dutch East Indies.

The sago palms grow to a height of 30 feet or more in low marshy soils. Their strong trunks have a hard outer layer, nearly two inches thick,

and inside this is the spongy portion which contains the starch product. The trees flower only once, when they are about 15 years old, and die after maturing their seed. To make sago they are cut down just before they are ready to flower, for the production of the fruit exhausts the starch centre. The pith is chopped and grated to a powder and mixed with water to extract the starch particles. This is kneaded in water in a sieve or cloth, the water carrying off the starch and leaving the woody fibre behind. The starch is then allowed to settle and is dried. When pressed through a sieve it forms fine pearly grains which are the "pearl sago" of commerce. It is eaten in the form of cakes or soup by the natives, to whom it is an important article of everyday diet. Sago is rich in carbohydrates (starch and sugar) and is easily digested.

The spineless sago palm, *Metroxylon laevis*, and the prickly sago palm, *Metroxylon rumphii*, furnish the bulk of the sago that is exported to Europe and America.



BARKING A SAGO PALM

Sago is extracted from the soft inner portion of the sago palm. The tree is felled just before seeding and cut into short lengths, after which the soft inside portions are extracted and pounded in water until the starchy product is separated.

Photo Nan Sing

SHIFTING SANDS *of the* GREAT SAHARA

The greatest desert area of the world, the Sahara has tempted many explorers in the past to cross its lifeless wastes. Nowadays one may follow their trail in a motor-bus across the endless sands.

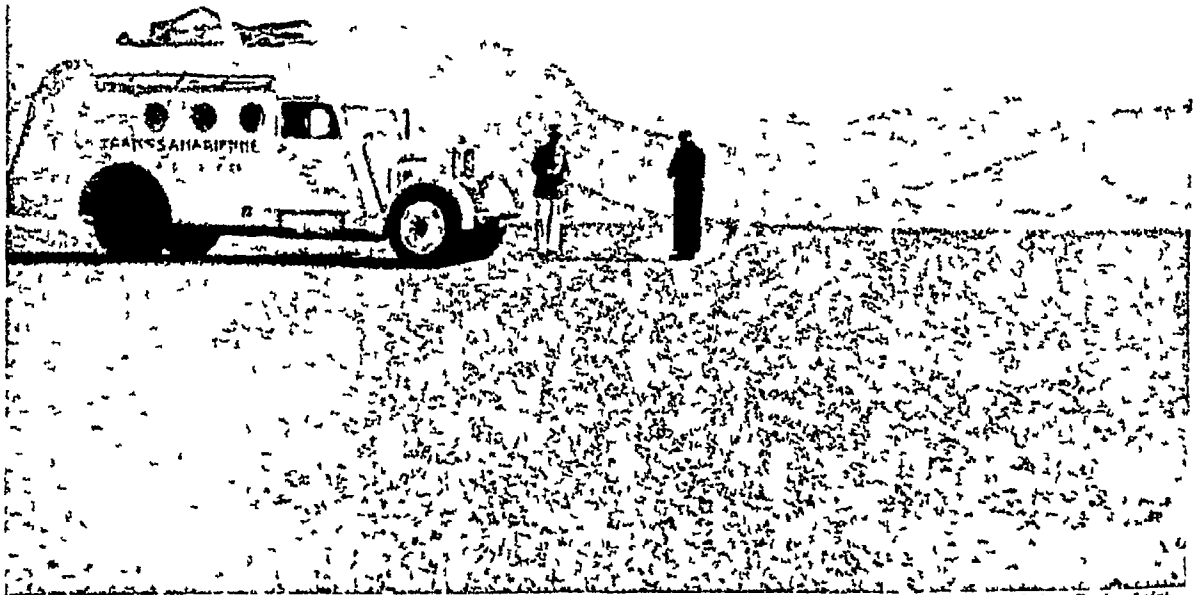
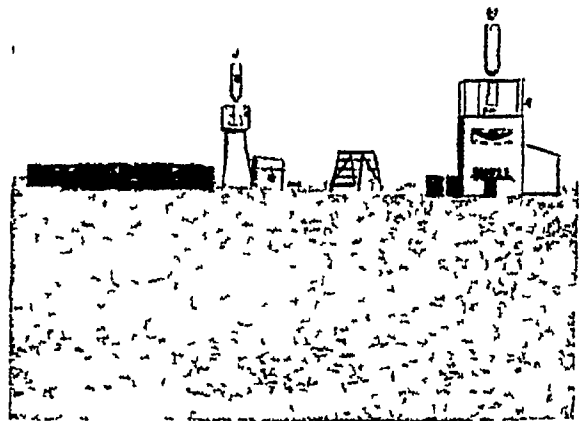
Sahar'a. Of all the deserts of the world, the Great Sahara is king. With a length of 3,200 miles and an extreme breadth of 1,400, making an area of about 3,500,000 square miles, it is nearly equal in size to the whole of Europe. From the Atlas Mountains on the north to the Sudan on the south, and from the Igdiregion of Morocco to the Nile valley, there is not a single river. Occasionally the "wadis," or dried beds of ancient streams, will carry torrents of water after one of the rare cloud



bursts, but this is quickly swallowed up in the thirsty earth, or goes to feed the infrequent springs and wells which form the centre of scattered oases.

The Sahara contains many lofty and rocky ranges and plateaux in the interior, some with peaks from 8,000 to 9,000 feet in height, crowned with snow in the winter. The lack of rain in the

Sahara is due to the great land mass of Africa, which causes an outflow of air during the winter, thus driving away ocean moisture. In the summer, when there is an inflow of winds, the ground is so intensely heated that the winds are dried up before they have reached far inland. In the eastern part are several spots below sea-level, usually containing oases, which show the natural fertility of most of this desert soil wherever moisture is sufficient. The chief habitable areas are Tuat, south of Algeria, and



Photos Dorien Leigh

MODERN TRANSPORT MAKES LIGHT OF DESERT SANDS

Three routes across the arid wastes of the Sahara are now practicable for motor-cars, owing largely to the enterprise of the Shell company, which has established a series of permanent refuelling stations in the desert. One of these stations is shown in the upper photograph. The lower photo shows a motor-coach of the French Compagnie Generale Transsaharienne on one of its regular services across the vast wilderness, from the Algerian coast to the Niger.

SAHARA



SAHARAN SCENES

Above is a view from El Golea ("the fortress"), a ruined village of the Sahara, looking towards an oasis nestling at the foot of a conical hill of red rock. Below, right, is a Tibbu, or 'man of the rocks,' member of a nomad negro Berber race of the eastern Sahara, with his swift 'mehari,' or riding camel.

(photo top The Times" bottom Mondiale

Ghat and Kufra, to the south of Libya. The greatest of the oases is El Erg, just south of the Atlas Mountains, where enough water is found to irrigate millions of date palms.

The great shifting sand dunes of the Sahara are believed to have been created by the violent and sudden changes of temperature. Under the boiling noonday sun the ground sometimes gets as hot as 200° F, yet at night the temperature may fall below freezing. This causes the natural desert rock to crumble, forming sand, which is then swept up by the wind and whipped against other rocks, eating them away in turn.

The central desert is inhabited by the wild tribes of Tuaregs, the east by Beduin and Tibbu, the latter of mixed negro stock, and the west by Berbers. The wild animals found in the desert today are jackals, foxes, hares, a few gazelles and antelopes, and a few species of birds, among which figure the ostrich, the vulture and the raven.

With the exception of a Spanish colony (Rio de Oro) on the west coast, and the Fezzan, which is attached to the Italian colony of Libya, the greater part of the Sahara (about 1½ million square miles) is French territory—Mauritania,



French Sudan, Algeria, and the Colony of the Niger

The principal towns in the Sahara, or so close to its fringes that they serve as caravan centres, include Ghadames, Murzuk, Kufra, Ghat, and In Salah in the north, and mysterious Timbuktu and busy Gao on the river Niger in the south of the area

The French are pushing railway lines into the desert from the north and are constantly boring new artesian wells to bring prosperity to the

scattered tribes they have now in most part subdued with the aid of the Foreign Legion and regular troops. Three north-to-south routes for motor vehicles and aircraft across the desert have been opened up, and the Shell oil company has established refuelling points at intervals along them. One of the most remote goes by the name of *Bidon Cinq* (Petrol tin No 5). There are regular French and Belgian air mail services across the Sahara to the Congo, and also a passenger and mail motor-coach service

Over the Burning Sands with a Caravan

IT is three o'clock in the morning on the edge of the great Sahara desert. The stars are still shining through the tall date palms that sway in the light breezes from the south. Scattered over the ground are black humped shadows of sleeping camels. Smaller dark blots are grazing donkeys and goats, and here and there are the white, outstretched figures of Arabs. One of the figures stirs and rises, gazes a moment at the sky, and sends out a weird call.

The effect is magical. On all sides noisy life springs up from silent sands. Camels lift their long necks with complaining groans, donkeys bray, goats bleat, dogs bark, men shout to one another as they bustle about in the growing dawn. Small fires blaze up. The Arabs are at their prayers or rolling up their mats, while black servants prepare the simple breakfast and load the complaining pack animals.

We Set Out at Dawn

It is the hour for the big caravan to start on its thousand-mile journey southward across the desert. By the time the orange-gold of the morning sunlight touches the tip of the highest date palm, the long line of men and beasts is on its way. Slowly it crawls like a huge loose-jointed snake over the endless wilderness.

At the head of the column rides the caravan chief on a prancing horse. A long rifle is slung over his back, and his face and entire figure are muffled in flowing white. Behind him in narrow file *pace* hundreds of heavy-footed camels, balancing on their backs bales and boxes containing cotton-cloth, silk, sugar, salt, tea, small metal articles, together with beads and scores of other trade wares. By their side walk the owners or drivers, leading donkeys carrying food and water for the long march. The goats, which furnish milk or are to be killed for meat, straggle along at the rear, keeping barely ahead of the snapping dogs that help in herding them.

It has taken perhaps a year to gather the men and beasts and merchandise for this great caravan. Arab and Jewish merchants in the coast towns of North Africa—Tripoli, Tunis, Algiers—have invested their fortunes in those

swaying camel packs. They will wait anxiously another year, perhaps, before these "desert ships," having cruised to the southern shores of the great ocean of sand, return with precious loads of ivory and gold, skins, and ostrich feathers, gathered by barter with the natives in the heart of Africa.

Meanwhile the caravan moves on, at perhaps two miles an hour, treading the old trail worn deep by the pads of camels and the naked feet of men in the course of centuries. The sun rises higher, and the heat strikes down and flares up again from the sand in shimmering waves. The cries of the animals are hushed. The only sound is the creaking of leather in the packs, and the endless *pad, pad, pad, swish, swish, swish*, of the hundreds of heavy feet dragging across the sands.

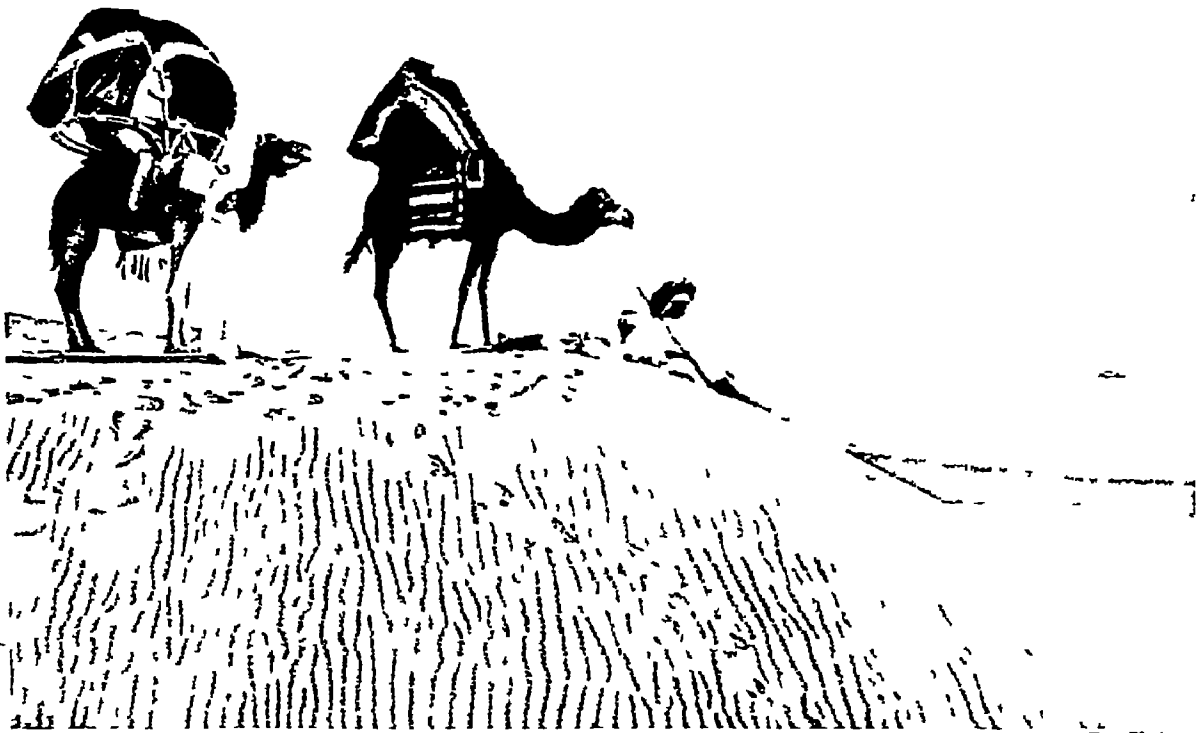
To break the silence that leads to desert madness, and to forget that fierce burning light that bites at men's eyes and makes them blind, a plodding Arab starts a weird caravan song, timed to the monotonous beat of the camel's stride. The chant spreads up and down the line, and the empty hills echo the brave deeds of ancient heroes.

Midday Rest from the Scorching Sun

From ten in the morning until three in the afternoon the caravan rests to let the worst heat of the day pass by. If they have reached an oasis—where there are water and palms and green grass—men and animals may stretch themselves in the shade. If the stop is in the open desert, they lie or crouch on the sand, the men throwing their cloaks over their heads.

But the heat, the constant fear of a dried-up well that may leave men and animals to die of thirst, the sudden sandstorms that sweep across their path—these are not the only dangers that beset the caravan. For in the heart of the great desert dwell a strange race of men, the masked Tuaregs, who prey upon the caravan trade and levy tribute upon all who pass their way.

Perhaps, while the march is on, the caravan leader will see black specks on the horizon moving rapidly forward. A halt is called. Soon two or three Tuaregs sweep up on their racing



For Photos

IN THE MIDST OF THE SAHARA'S SUN BAKED WASTES

Here, on the summit of one of the dunes that break the seas of sand, the travellers pause to gaze ahead, one of their number remaining seated on the camel protected from the blazing sun by a curtained "shugduf." Though motor-cars now speed over the old caravan tracks, the camel still remains the only means of transport for the nomadic tribes of the Sahara.

camels. For a certain sum in money or merchandise they will protect the caravan, otherwise—

Stubborn caravan leaders have sometimes refused to deal with the Tuaregs. Some of those caravans were never heard of again, or perhaps a few survivors, dying of thirst, have staggered into an oasis to tell of a sudden ambush, the swoop of hundreds of masked men, shots, knives flashing, camels stampeded over the desert with their loads, and everything lost.

St. Albans. Twenty one miles north west of London, in the county of Hertfordshire, stands the city of St Albans. The abbey church was consecrated in A.D. 1115 and became a cathedral in 1877, the central Norman tower (145 feet high), faced with Roman tiles, is still intact, and the Gothic nave is the longest in existence (292 feet). (See illustration, page 872)

To the south of the city are the remains of the British-Roman city, Verulamium, on the great Roman road known as Watling Street. Much of the stonework of Verulamium has been removed from time to time and used in the building of some of the local churches and other buildings. (See illustration in page 3518)

The chief industry of St Albans is straw-plaiting. Other minor industries include printing, brewing, and the manufacture of brushes and shoes. It has a population of 28,600.

St. John, NEW BRUNSWICK. In winter, when ice has closed many of the other Atlantic seaports of Canada, the great harbour of St John is always open. It lies at the mouth of the river St John, on the Bay of Fundy, whose immense tides, co-operating with the waters of the river, prevent the formation of ice. This advantage, together with the short railway journey from the interior, serves to strengthen the position of St John as the chief winter port of Canada. It is the Atlantic terminus of the Canadian Pacific Railway, and is also one of the termini of the Canadian National Railways.

Grain elevators, a large sugar refinery, cotton mills, iron and brass foundries, flour and rolling mills, saw and wood-pulp mills, wood-working factories, and other industrial establishments make St John one of the chief manufacturing centres of the Maritime Provinces. The name of the city and river comes from the circumstance that the explorer Champlain landed here in 1604 on the feast day of St John the Baptist. The population of St John is about 46,000.

St. Lawrence, RIVER. The St Lawrence is, perhaps, the most important water route for commerce in the New World. The Great Lakes (q.v.) find in it their natural outlet to the Atlantic Ocean, and on its waters great ocean-going steamers penetrate 1,000 miles into the heart of

the country—to the city of Montreal (*qv*), the great distributing centre for western Canada. Smaller vessels, avoiding the rapids above Montreal by means of locks and canals, can go direct to Duluth at the farthest end of Lake Superior, or to Chicago at the southern end of Lake Michigan—distant 2,343 miles and 2,272 miles respectively from the Atlantic.

The St Lawrence emerges from the foot of Lake Ontario and flows in a north-easterly

their beauty. An 11-mile-long road system, opened in 1938, bridges the river at this point, and gives improved communication between Canada and the U.S.A.

The importance to Canada of the St Lawrence cannot be over-estimated. The shortest freight route from the Great Lakes to Europe, it is the natural highway for shipping grain from the fertile regions of Canada and the north-western United States. It furnishes as well a means for

shipping large quantities of lumber and paper pulp directly overseas from the place of production.

The St Lawrence was discovered and named by Jacques Cartier, who was commissioned by the king of France to explore the American coast. In 1534 he entered the Strait of Belle Isle and encircled the gulf, but it was not until a second voyage two years later that he discovered the entrance to the river, and named it in honour of the saint on whose feast day he arrived. He penetrated as far as what is now Montreal, but established no settlements. In 1608 Champlain planted a colony on the site of Quebec, and later explored the river to Lake Huron.



THE ST LAWRENCE RIVER AT MONTREAL

Montreal's harbour, on the river St. Lawrence, seen above, is a thousand miles from the open sea and farther inland than that of any other of the world's great ports. On the left is the Longueuil and Victoria bridge, and on the right the new Jacques Cartier bridge, opened in 1930.

This aerial view is taken from the south bank of the river, looking towards the city.

Photo Canadian Official News Bureau

direction until it discharges its waters into the Gulf of St. Lawrence, the outlet to the Atlantic being either south of Newfoundland past Cape Ray and Cape Breton, or north of Newfoundland through the Strait of Belle Isle. The latter course is the shortest route to England, but not the one usually followed by vessels on account of the greater danger from fog and ice.

About 400 miles upstream from the island of Anticosti is the quaint old French-Canadian city of Quebec (*qv*). From Quebec to Montreal, 160 miles farther upstream, the channel has been improved to permit large vessels to reach the latter city. For a distance of 30 miles above Montreal there is a series of rapids round which several canals with locks have been built.

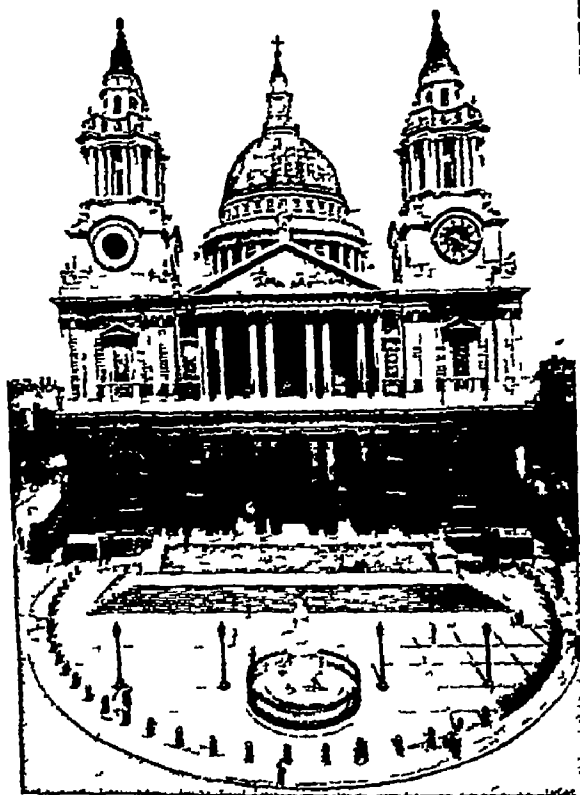
About 100 miles above the rapids the St. Lawrence widens into a narrow lake studded with the Thousand Islands, world-famed for

St. Paul's Cathedral, LONDON

Long before Christianity came to Britain it is said that a Temple of Diana stood on the site now occupied by St. Paul's Cathedral. Ethelbert, king of Kent, is known to have built a fine Christian church there, about 1,300 years ago, but this was destroyed soon after the Norman Conquest (1066), to make room for "Old St. Paul's." This structure was seventy feet longer and 124 feet higher than the present building. Harrison Ainsworth, in his historical novel "Old St. Paul's," recalls with remarkable vividness the events leading up to the destruction of the mighty edifice, in the Great Fire of 1666, after which Sir Christopher Wren (*qv*) built the present cathedral which took thirty-five years to complete.

The most imposing feature of the whole cathedral is the dome. Actually, this consists

ST. PAUL'S CATHEDRAL: WREN'S MONUMENT



Dominating the City of London from its position on the top of Ludgate Hill, the famous cathedral of St. Paul raises its massive dome far above the surrounding roofs. The upper photograph shows Sir Christopher Wren's fine building from the east, while below left, we see the west front with its flanking towers. Linking them is the main portico, to which two broad flights of steps give access. Right is the High Altar, the Reredos, of white Parian marble, is flanked by an open colonnade, with small doorways leading to the apse behind. The two bronze candlesticks are copied from those of St. Bavon's Ghent.

Photos A. F. Kersting Photochrom & W. S. Campbell

of a large outer dome and a much lower inner dome. In between them a hollow cone of brick-work supports the lantern, ball, and cross—365 feet above the ground. In the Whispering Gallery, running round the inside of the dome, a whisper near the wall on one side can be heard distinctly on the other, 100 feet away. The hollow golden ball below the cross is six feet in diameter and will hold ten people.

The tombs of many famous men, including those of Wren himself, Nelson, Wellington, Roberts, Jellicoe, and Beatty are to be seen in the cathedral. St Paul's is generally chosen for services of a national character, as, for instance, at the Jubilees of Queen Victoria and King George V.

St. Swithin's Day (JULY 15)

Quite how the 9th-century patron saint of Winchester Cathedral gave his name to the legend of St Swithin's day is not known. According to tradition, he was of noble birth and became a priest at Winchester. He was King Egbert's adviser and tutor to his son Ethelwulf, who made him Bishop of Winchester (A.D. 852). Ten years later he died and was buried in the churchyard of the cathedral—in a place where, according to his request, the rain from the eaves might drip on the grave.

When, a hundred years later, the cathedral was dedicated to him, his body was exhumed to be transferred to the new church on July 15, 971. But the monks are said to have been prevented from doing this by rain which lasted for forty days without ceasing. Either this or his peculiar request concerning his burial place may be the origin of the old weather adage.

St Swithin's Day if thou dost rain
For forty days it will remain,
St Swithin's Day if thou be fair
For forty days 'twill rain no more.

St. Valentine's Day. Like many other things that have originated far back in folk and village customs, it is impossible to date or explain accurately this festival of February 14.



SALADIN THE BRAVE

Saladin, Sultan of Egypt and Syria, was the Mahomedan leader at his best—devout, courageous, kindly, and chivalrous. His name lives in history as that of a great leader who stemmed the tide of Western encroachment on the lands of the East. This illustration is after Gustave Doré.

Nothing that we know of the several saints of that name helps us. Some time in the Middle Ages, certainly as early as Chaucer, the young folk of the hamlets of England, Scotland and parts of France assembled on St Valentine's eve and drew names from an urn. The person whose name was on the slip was the holder's "valentine" or sweetheart for a year. Later the upper classes took up the custom. Presents were exchanged and services performed like those of a knight for his lady.

Some see behind this custom a somewhat similar one of the Roman youths on the feast of Lupercalia in February, and attribute the use of the name of a saint for the day to an effort of the early Christians to improve a pagan custom they could not wholly stamp out. When and how

the old customs were changed into the sending of our valentines no one knows.

Saladin. (1138–1193) "Before I saw his face I was sore afraid, but now that I have seen him I know that he will do me no harm"—these are the words of a Crusader who was taken prisoner and brought before Saladin, Sultan of Egypt and Syria, the noblest foe that the knights of the Cross ever encountered. By the Mahomedans he was revered as a wise and merciful ruler, a leader who was able to unite his people and turn back the tide of Christian invasion, and as a man who embodied the highest virtues of Islam.

His leadership came at a time when it was sorely needed, for the Mahomedan world was sinking into decay. Since the First Crusade had won Jerusalem for Christendom, the empire of the Seljukian Turks, who held the temporal power of Islam, had been falling apart. It was not the strength and zeal of the Christians so much as the weakness of their foes that had kept the Christian kingdom of Jerusalem alive.

The original name of Saladin was Yusuf ibn Ayyub. Salah-ed-din (or Saladin) was the title given him, meaning "Honour of the Faith." He came of that strong and warlike race of Asia.

Minor, the Kurds, and his father was Governor, under the Seljukian Turks, of the province of Tekrit in Armenia

Saladin was sent by Nur ed din the Seljuk Sultan of Syria, on an expedition to Egypt, which resulted in the winning of that land for Nur ed din and eventually in the appointment of Saladin as Vizier of Egypt. When Nur ed din died, rebellion broke out against his young heir, and Saladin overran and gained control of Syria. The Caliph of Egypt having died also, Saladin was now the most powerful ruler in Islam, and the Caliph of Baghdad recognized him as the Sultan of both Egypt and Syria.

Saladin Captures Jerusalem

Saladin's great purpose was to win back for Islam the lands embraced in the kingdom of Jerusalem, and when, in 1187, one of the Christian leaders broke faith, he seized the opportunity to proclaim a Holy War and overran Palestine. Jerusalem was besieged and captured (1187), and the entire Christian kingdom, except Tyre, was conquered.

It was to regain Jerusalem that the Third Crusade was undertaken by the Christian rulers of Europe, notably Philip Augustus of France and Richard I of England. But the struggle ended with Jerusalem and all Syria, except the coast-line, in the hands of Saladin. The treaty of peace signed in 1192, however, provided that Christian pilgrims might freely visit the Holy Sepulchre at Jerusalem.

Saladin was a favourite figure in medieval romance, and Sir Walter Scott, in his book "The Talisman," has given us a noble picture of his chivalry and faithfulness to his word, shown particularly in his dealings with his great adversary, Richard the Lion Heart.

Salamander. You will perhaps have heard of the salamander as a creature which is supposed to be able to live through fire, but this is the last thing it can do! For these animals are closely related to frogs and toads, and classed as *Amphibia*, and, like their relatives, they revel in a moist atmosphere.

The spotted salamander (*Salamandra maculosa*) is common on the Continent of Europe, in Algeria, and in Asia Minor. It is harmless when it is

gently treated, but when roughly handled it squirts out a milky white poisonous fluid, and possibly for this reason exhibits "warning coloration." It is black, spotted with orange-yellow, and is about 8 inches in length. In the spring this amphibian leaves its winter hiding-place under stones or roots of trees and, after mating, produces from 10 to 50 young, which are born in the water of a brook. The young tadpoles grow rapidly. Soon their gills shrink, and they start their life on land. They hide in the daytime in damp and shady spots in a torpid condition, and come out at night to feed on insects and other small animals. As they love the wet, these creatures are often seen in large numbers in damp and thundery weather.

Two other European salamanders are the smaller black Alpine salamander (*S. atra*) and the Caucasian salamander (*S. caucasica*), which is black with yellow spots. The former of these is found only in the Alps, its young, three or four in number, are born well developed, without gills, for this beast only lives high up where the very small tadpoles would be unable to survive. The giant salamander (*Cryptobranchus maximus*) of Japan is much larger than most salamanders, being usually about 3 feet long, and sometimes reaching nearly 4 feet.

A very strange kind of salamander is the Mexican axolotl (*Amblystoma tigrinum*), which is found in the lake near the city of Axolotl. This most extraordinary creature never grows up, remaining a tadpole all its life and bringing up families of tadpoles. On dry land, however, it can develop into a regular air breathing salamander.

Salisbury. (Pron sawlz'-bur i) About two miles north of the present city of Salisbury there stood an ancient British encampment.

The Romans made it into a fort and called it Sorbiodunum. By Saxon times it had become a town, and in the 11th century it boasted a Norman cathedral. In 1220 Bishop Poore rebuilt his cathedral near the River Avon, and thus founded the city now known as Salisbury. Seven years later the inhabitants of the old town (now Old Sarum) migrated to the new city, which was officially named New Sarum.



BLACK AND YELLOW SPOTTED SALAMANDER

This creature's colour-scheme constitutes a good example of warning coloration for in Nature every predaceous creature knows well that it must beware of eating any black-and-yellow object. This species is not uncommon in the mountains of Central Europe.

Photo Hugh Stain

SALISBURY

Salisbury Cathedral is a perfect specimen of Early English architecture. It is 473 feet long, with a spire 404 feet high—the tallest and most elegant spire in England. The spire is visibly out of the perpendicular. (See illustration on page 869)

The city of Salisbury is an agricultural and military centre, with most of its streets laid out on a rectangular plan. It is the county town of Wiltshire and has a population of 26,400.

There is also a Salisbury in Africa—the capital of Southern Rhodesia, and the centre of an important gold-mining and agricultural area. It has a population of 32,000, including 11,000 whites.

Salisbury, 3RD MARQUESS of (1830-1903) Robert Arthur Talbot Gascoigne-Cecil, 3rd Marquess of Salisbury, was a typical Conservative of the old school. A cautious statesman, massive in body and mind, and ripe in experience, he realized to the full the importance of keeping



Arthur Brook

SALMON 'SNAPPED' IN MID-LEAP UPSTREAM

On its way upstream towards its breeding haunts, the salmon refuses to be stopped by such obstacles as waterfalls, but leaps up them, strong in its fresh vigour. Here the photographer has actually caught one of these fine fish as it flies through the air, straight as an arrow, over the swift falls. If it alights only in the middle, it may even then manage by a swift stroke of its tail to hurl itself into calm water beyond

SALMON

peace in Europe, and eventually came to be recognized as the ablest and the most trusted diplomatist of his generation.

A direct descendant of Lord Burghley, Queen Elizabeth's adviser, Lord Robert Cecil (as he then was) entered the House of Commons in 1853, and in 1866 became Secretary of State for India, succeeding his father as Marquess of Salisbury two years later.

He was appointed Foreign Secretary in 1878, in which year he was associated with Lord Beaconsfield at the Berlin Congress. In 1885 he became Prime Minister and Foreign Secretary, and again in 1886, and he was Premier from 1895 until his resignation at the end of the Boer War in 1902, having surrendered the Foreign Office to Lord Lansdowne in 1900. His five sons include the 4th Marquess, Lord Robert Cecil, created Viscount Cecil of Chelwood in 1923, and Lord

Hugh Cecil, provost of Eton College.

Lord Salisbury sought no honours and accepted few. He was made K.G. by Queen Victoria and was also Lord Warden of the Cinque Ports.

Salmon. The salmon, hatched in fresh water, "runs away to sea" under the urge of some mysterious instinct when about two years old. An instinct just as imperious brings the fish swarming home about two years later, to spawn in fresh water. They come in such numbers that sometimes they fairly choke the rivers, and they are urged onwards so forcefully that they will leap six or more feet out of the water in order to clear the waterfalls in their course.

The salmon leaves the ocean in splendid condition, a large beautiful "clean run" fish with dark blue-black and silvery black-spotted sides, weighing from 20 to 40 lb and upward. It

SALMON

eats nothing after entering fresh water, although anglers successfully tempt it with a large lobworm or a prawn, and infuriate it into snapping at bright flies or "minnows." Far up the river, often in some shallow stream, where the water is clear and the bottom gravelly, spawning takes place and the salmon, now a "kelt," returns, thin and worn out, to the sea.

The salmon fry are at first queer shapeless little monsters, known as "alevins," each with a comparatively huge yolk sac under its body. For about six weeks the alevin hides among the stones, eating nothing until the yolk sac is nearly absorbed. Next it has a dark banded and spotted coat, so unlike that of the adult salmon that the "parr," as the young fish is termed, was long believed to be a distinct species, it is impossible to distinguish it from a baby trout at this stage. When ready to go to sea it puts on a silvery coat and is known as a "smolt." On reaching the sea it becomes a "grilse" until mature.

Salmon (*Salmo salar*) are found in the seas and rivers on both sides of the Atlantic Ocean. In Norway, Sweden, Maine (U.S.A.), and Quebec there are "land-locked" salmon, which never reach the sea, spending their lives in lakes. The spawning season is usually in November and December. In England, the general rule is that salmon are not allowed to be caught in nets between September 1 and February 1, or by rods between November 2 and February 1, but the times may be varied for different rivers by the authorities. The tinning of salmon is an important industry in Canada and the U.S.A., the principal species in this fishery is the quinnat (*S. quinnat*), which has also been introduced into New Zealand. (See also Fishing)

Salt. Of all the chemicals that we take from the earth, salt is by far the most vital to our health and happiness. That it has been so from early times will be realized from the fact that our word "salary" comes from the Latin *salarium*, meaning "salt-money"—the allowance given to Roman soldiers to buy salt. Among the ancients, as among some Oriental peoples of the present day, a meal containing salt has a sacred character, and to "eat the salt" of a man was to create a sacred bond of friendship. In the Middle Ages one's social rank was shown by whether one sat above or below the salt at the table. High taxes on salt were one of the causes of the French Revolution.



PURE SALT IN BULK

Table salt is obtained from purified brine. This photograph shows pure salt in bulk at a salt mine in Widnes, Lancashire, belonging to the Salt Union Ltd. The principal salt deposits in England are found in Lancashire, Cheshire, and Worcestershire.

The chemical name for common salt is "sodium chloride," and its chemical formula is NaCl . It occurs in Nature both in beds or strata (when it is called "rock-salt") and in solution in water. Apart from the sea and salt lakes, the underground waters of many regions contain salt. The salt of commerce is partly mined from the beds of rock salt, and partly extracted from salt waters. In the latter case the brine may be natural, as in the case of the sea, salt lakes, and salt wells, or it may be artificial. In the case of artificial brines, fresh water is allowed to flow over beds of salt, and from the resulting solution salt is extracted.

In the extraction of salt from salt water two general processes are used. In one the water is allowed to evaporate in the open air under the influence of the sun, and in the other evaporation is hastened by means of artificial heat. By the former process the coarse salt, and by the latter the fine salt, of commerce are obtained.

Beds of rock-salt represent deposits made on the bottoms of salt lakes and lagoons. In some lakes, such deposits are being made at the present time. Similar deposits have been

SALT

made in the past—some of them millions of years ago—and subsequently buried by layers of sand, mud, etc. The salt in solution in underground waters may have been derived from salt beds over which the waters, soaking in from the surface, have passed. Some of the natural underground brines may represent seawater with which the sediment was originally filled and which has never been drained out.

In the Salzkammergut region of Austria there are salt mines with chambers and passages extending for many miles, the roof being supported by massive pillars of the rock-salt. The United States produces more salt than any other country. Great Britain (Droitwich, Northwich, and Middlewich), Russia, Germany, France, India, Spain, and Italy are also great producers.

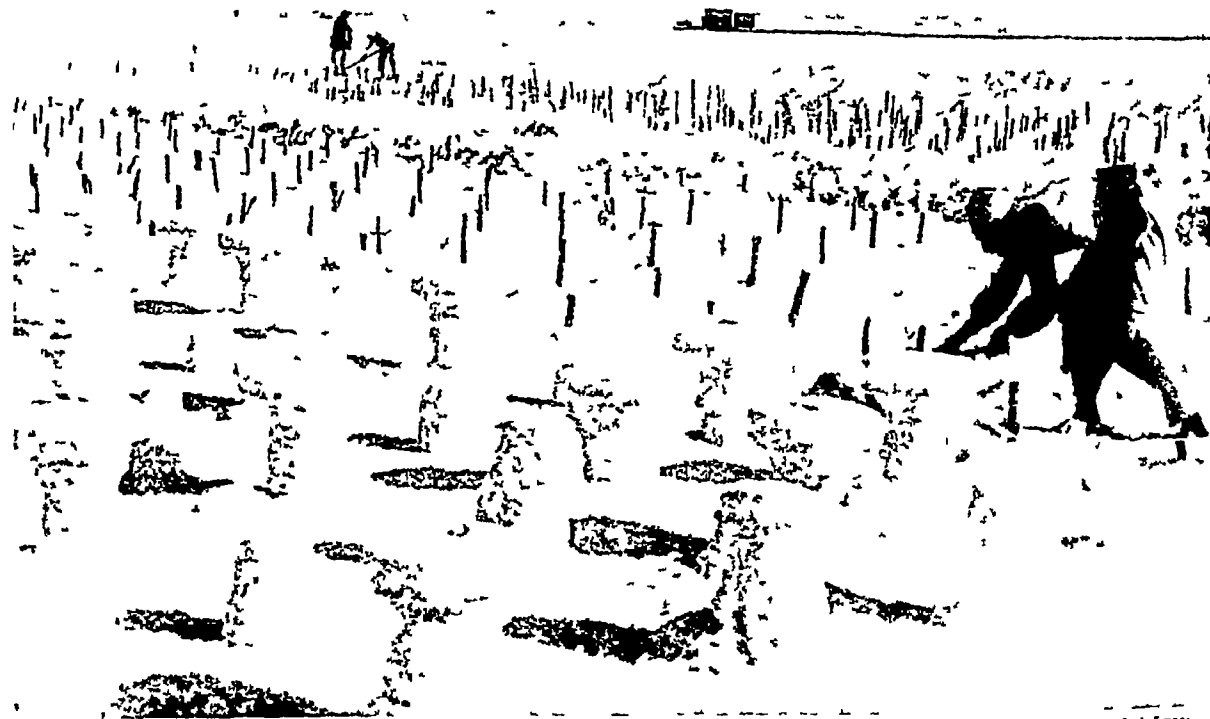
Sodium compounds are needed in our bodies and in the bodies of all animals, and since most of our food does not contain enough of these compounds we use table salt as a seasoning. Deer and other wild animals regularly resort to certain springs for the salt obtained there.

Salt was used to flavour and preserve food long before the beginning of recorded history. Where there was no supply near at hand it was brought from great distances, and thus became one of the most important articles of early

commerce. One of the oldest roads of Italy was called the *Via Salaria* ("salt road") because it was the route by which salt was transported. The caravan trade of the Sahara is still largely a trade in salt. In some remote parts of the world, such as Central Africa, salt is even today one of the most prized of luxuries. Cakes of salt have even been used as money.

Several of the chemicals (see Chemistry) most important in industry are made from common salt. Of these there are hydrochloric acid, (*qv*) metallic sodium, chlorine, and soda. Glauber's salt, which is a crystalline form of sodium sulphate, is used in glass-making, in dyeing, in the manufacture of other chemicals, and in medicine. This is the chief medicinal agent in certain mineral waters, such as those at Carlsbad, Germany. Sodium sulphide (Na_2S) is used in the textile and leather industries and in the manufacture of synthetic dyes. Sodium thio sulphate ($\text{Na}_2\text{S}_2\text{O}_3$) is the familiar "hypo" used in photography.

Epsom salt is a hydrated form of magnesium sulphate. It occurs abundantly in Nature, getting its name from Epsom, where it was found in the water of a spring. Effervescent fruit salts are a mixture of sodium and potassium tartrates, sodium bicarbonate and dry tartaric

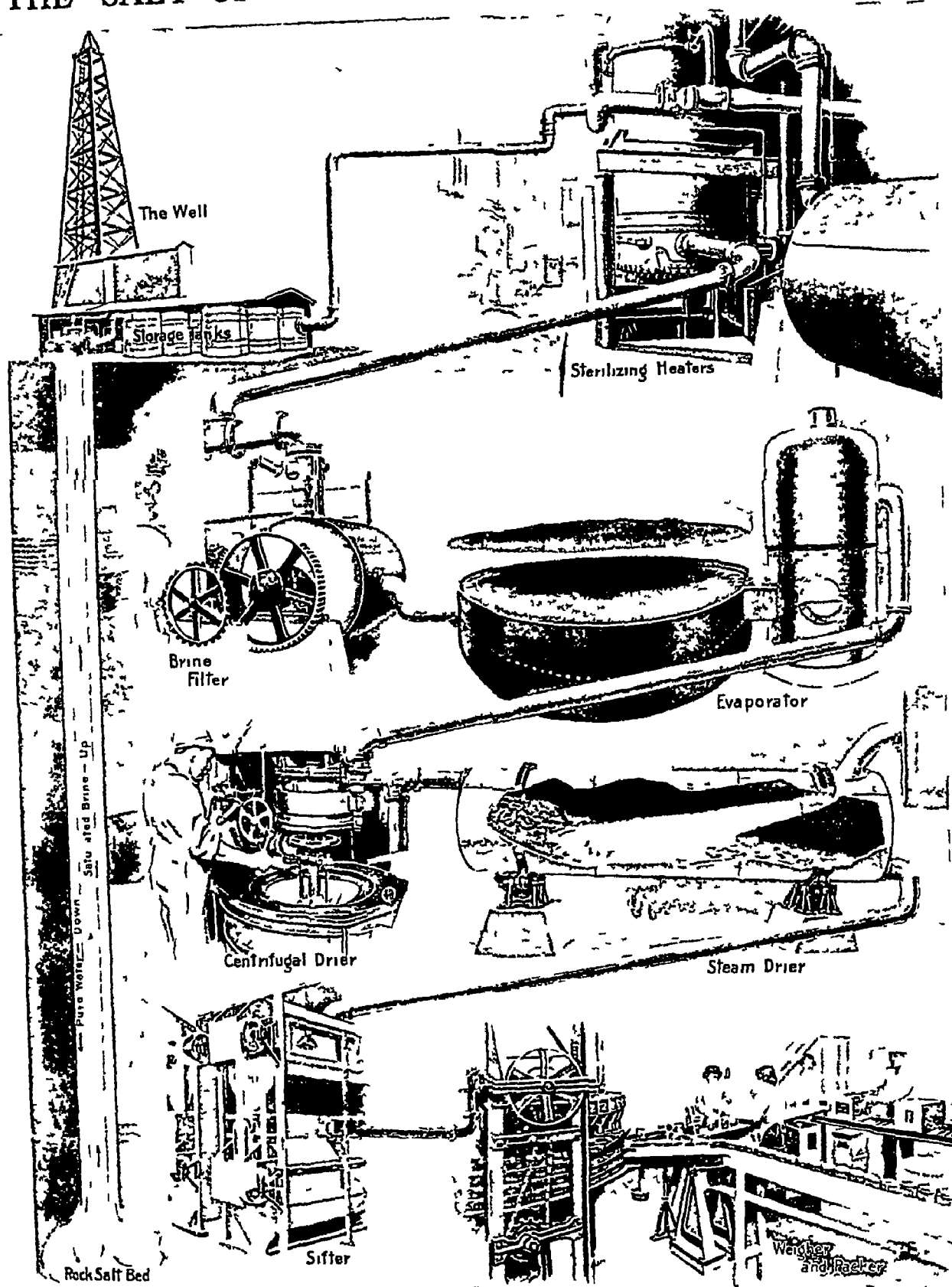


HARVESTING SALT IN THE LAND OF EGYPT

Associated Press

But for the costume of the man on the right, one might well imagine this to be a photograph of an Arctic ice-field. In reality it shows the salt crop being gathered from the old bed of Lake Mariut, in Alexandria, Egypt. Sticks are planted, the bed is flooded and when a thick mass of salt crystals has formed round the sticks, it is chipped away with pickaxes. The yearly output of this lake-bed alone amounts to 100 000 tons.

THE 'SALT OF THE EARTH' FROM MINE TO TABLE



A salt well has two pipes, one within the other. Pure water is forced down the outer pipe into a cavity in the rock salt bed, and the saturated brine is forced up the inner pipe by the pressure. The brine is then forced through a series of heaters, which precipitates the gypsum, and this gypsum is removed in gravel laden filters. Evaporators then get to work on the purified brine to form the salt grains. These are next treated in centrifugal driers, which revolve at high speed and drain off most of the water through fine screens. All remaining moisture is removed in steam driers, which revolve slowly on an inclined plane, while a jet of heated air plays on the descending salt. After the fine flakes have been sifted through copper-screened bolters, the finished salt is automatically weighed and packed in containers ready for kitchen use.

acid powder When water is poured on this mixture a reaction takes place between the acid and the bicarbonate The little bubbles of gas that are formed are carbon dioxide (*qv*) This effervescing mixture is drunk as a mild aperient

Saltpetre. Nitrogen (*qv*) is absolutely essential to the growth of plants, and since animals and men are dependent upon plants as food, nitrogen is of vital importance to us Of the nitrogenous fertilizers (see Fertilizers) used to supply plants with nitrogen, saltpetre is the most important Chemists call it "sodium nitrate," and write its formula thus, NaNO_3 It cannot be used in this form for making gunpowder, because it gathers moisture from the air, but just because of this fact it is all the more valuable as a fertilizer It is prepared from Chile saltpetre (see Chile), which is found in great beds, sometimes ten feet thick, covering an area 260 miles long by two or three miles wide

Nitre is the potassium salt similar to saltpetre To the chemist it is known as "potassium nitrate," and he will tell you that its chemical formula, which shows what it is composed of, is KNO_3 (See Chemistry) He will also tell you that it forms colourless six-sided crystals, that its taste is cooling and very salty, that it dissolves in water but not in alcohol, that it is used in many other ways besides in fireworks and gunpowder, and that it is found naturally in the soil of many countries

Salvador, CENTRAL AMERICA Of the total area of this little Central American republic, 80 per cent is cultivated—probably a world record The population is 125 per square mile

The country is crossed by two high mountain ranges, in whose tropical valleys the soil, of decomposed lava, is very fertile Coffee, which forms 90 per cent of the country's exports, grows on the mountain slopes "Peruvian" balsam, grown only in Salvador, comes from the Balsam coast, and is raised by the strange tribe of Balsimo Indians, who own all their property



SALVADOR SUNSHADE

In Salvador, that land of burning sunshine, Nature provides means of abundant shade in the huge leaves of the plantain, a food-plant allied to the banana Tradition connects the plantain with the forbidden fruit of the Garden of Eden

in common and are said to bury large sums of money in the forest each year with religious ceremonies

Other exports are sugar, indigo, henequen (sisal fibre), rubber, and tobacco Maize, beans, and rice are the chief food crops, and many cattle are raised Gold and silver are mined in limited quantities

Henequen is used in a great variety of local industries—notably the manufacture of ropes, hammocks, and similar articles Native craftsmen produce hats and shawls, saddlery, shoes, cigars, and cigarettes There are, however, few factories in Salvador It is estimated that only one eightieth of the available water power is utilized as yet Absence of raw materials and skilled labour are obstacles to industrial development

Salvador has the most curious, the most dangerous, and the most beautiful volcanoes in America It is a land where the earth trembles frequently, where lakes rise and fall, and where peaceful rivers suddenly become rushing torrents There is no more wonderful volcano in the world than Izalco, the "Lighthouse," so called because its red glow makes it visible to sailors by night

This cone began to rise out of the plain over a century ago and is now more than a mile high, having built itself up by its own ashes The majestic San Salvador, overlooking the capital city of the same name, had been dormant since the occupation of the Spaniards and was thought extinct Suddenly, in 1919, this volcano belched forth lava from fissures in its sides The eruption, with the accompanying earthquake, destroyed nine-tenths of the city Twice before, within a century, earthquakes had destroyed San Salvador

Salvador, the government of which is headed by a President elected for four years, is divided into 14 departments

Although the smallest of the Central American republics, Salvador has been called "Central America's good example" In the past few years

SALVADOR

the country has made astounding progress in constructing a network of excellent highways and extending the railways to connect the capital, San Salvador (population, 100,000) with Santa Ana, Cutuco (the chief port), Acajutla, and Ahuachapán

Salvador was named by its Spanish conqueror, Pedro de Alvarado, after the "Holy Saviour" (San Salvador). Its people are largely of mixed Spanish and Indian blood, and speak Spanish. With their neighbours they revolted from Spain in 1821. The republic's area is 13,176 square miles, and its population about 1,500,000.

Salvage. Thrilling stories of real "treasure hunting" on the bottom of the sea are told by the divers and salvage-men whose job it is to bring up the gold of a sunken ship, or even the wreck itself. We have only to remember the work of the Italian salvage ship *Artiglio*, which in 1930 found the P & O liner *Egypt*, sunk off Ushant in a collision eight years before. Nearly £1,000,000 worth of bullion was raised to the surface and brought to England by the *Artiglio's* deep sea divers.

The German fleet, surrendered and scuttled in Scapa Flow just after the World War, has now been mostly salvaged. Other notable examples of salvage work in recent years have been the locating and inspection of the *Lusitania*, and the attempted raising of the submarine *M2*, which sank off Portland in 1932.

The most usual methods of raising a wreck are by lifting her with hawsers, by filling her with compressed air, or by pumping her out. When a sunken vessel is to be lifted, wire hawsers are passed under her hull by divers and made fast to special lighters placed on each side of the wreck. The lighters are lowered in the water by filling their ballast tanks from the sea. After the hawsers are made fast, the lighters are pumped out, which gives them increased buoyancy. This, added to the lift of the tide as it rises, enables the vessel to be hauled off the bottom and carried in the wire cradle to a place of security.

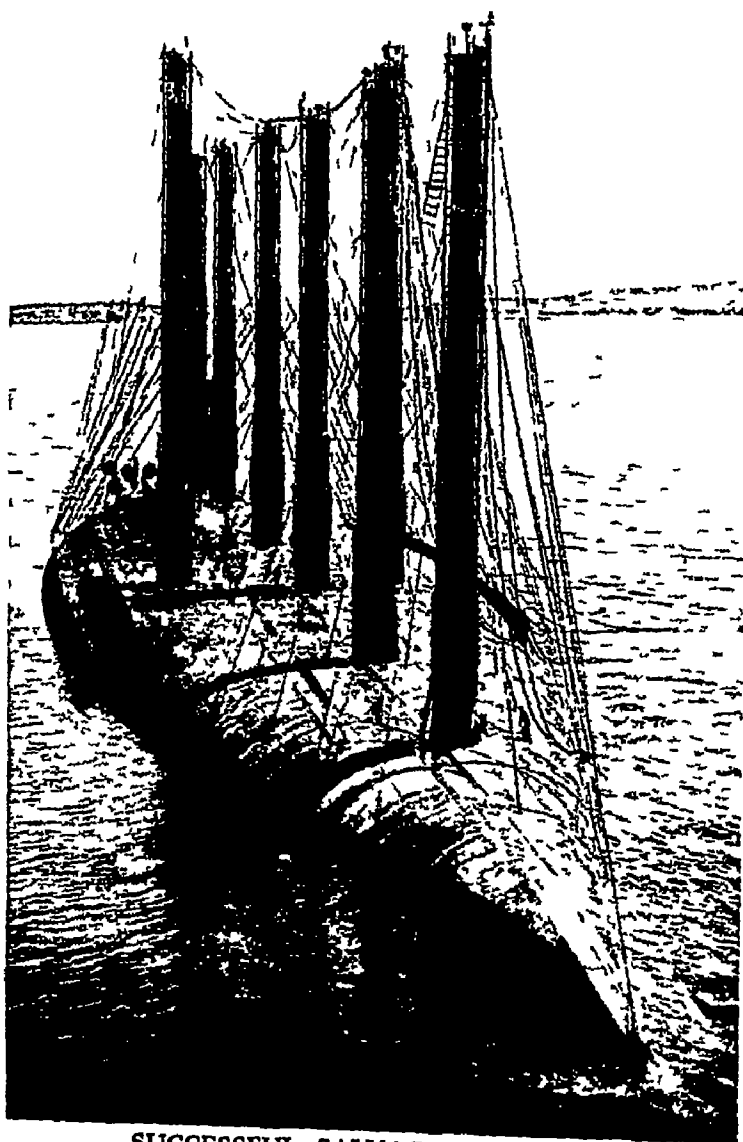
When compressed air is employed this is forced into the wreck by powerful compressors, which drive out the water until the ship becomes buoyant. For pumping operations the salvage engineer uses large steam and motor driven pumps and submersible electric pumps.

SALVATION ARMY

To claim salvage money in respect of ships on the high seas, the salvor must prove that his services were voluntary, that there was a possibility of total destruction if his services had not been rendered, and that these services were of benefit. When awarded, the money is divided in proportion among the owners, officers, and crew of the salvage ship. (See also Diving)

The London Salvage Corps, and similar organizations which undertake the dangerous work of removing property from burning buildings, work in conjunction with the Fire Brigade and the fire insurance companies.

Salvation Army. On the kerbstone of a dreary street in the East End of London, in 1865, stood an alert young Methodist revivalist named William Booth. Amid jeers and stones



SUCCESSFUL SALVAGE AT SCAPA *Fox Photos*

Can you guess what this is? It's the former German dreadnought *Kaiserin* upside down. Scuttled at Scapa Flow in 1919, she was successfully salvaged in 1936. The tall erections fastened to her keel are the air locks which were used to raise her. Many of the German ships scuttled at Scapa were salvaged in this way, being afterwards broken up for the value of their metal.

he began to pray for the rough men and women gathered about him. Yet despite this treatment Booth and a few followers (including his heroic wife) went there day after day, to invite the people to meetings which they held—now in a tent pitched on an old deserted cemetery, now in a cheap dance hall or old warehouse.

The 'Army' in the Modern World

Such were the humble beginnings of what became the great Salvation Army under its first "General," William Booth, whose descendants have carried on his work. Its organization and uniform were semi-military, and after 1877, when it first received its name, its growth was remarkable. Upon its own merits it has won its way round the world, and today in more than 90 countries and colonies—in Europe, Asia, Africa, the Americas, and Australasia—it is found vigorously living up to its aim: "To bring spiritual and material benefit to those whom conservative religious bodies do not reach."

The work of this widespread "army" of able, self-sacrificing men and women, who go quietly about in their plain yet distinctive uniforms, consists not only in standing at the street corners singing hymns to the accompaniment of a brass band, making collections in tambourines, and carrying on services both out-of-doors and indoors. But, realizing that sheer privation has driven many of the poor and lowly to desperate courses, the "Army" does wonders in the way of social relief.

Among the many establishments for lending a helping hand to "down-and-outs" are shelters and food depôts, day nurseries, hostels for men and women, industrial institutions, "prison gate" work, inebriates' homes, slum posts, and children's homes, labour bureaux, farm colonies, and so on. During the World War millions of men were directly aided by the Salvation Army's ambulances, and, above all, by the refreshments, entertainment, and "mothering" they received in the Salvation Army "huts."

The Salvation Army is supported by voluntary contributions—notably during Self-Denial Week—and by its publications, among which are the "War Cry," the "Young Soldier," and the "Warrior." Piety and ability alone are required of the officers, who are termed General, Commissioner, Lieutenant Commissioner, Colonel, and so on. Their religious beliefs are those of evangelical Christianity.

Samo'a. In the South Pacific, in a direct line between San Francisco, 4,200 miles to the north-east, and Australia, 2,400 miles to the south, is a chain of islands formed by some ancient volcanic upheaval and then ringed about by a coral backwater. Behind this, in the course of the ages, new fertile flats made yellow shores, and the land and mountain sides were covered with great forests and a great variety of ferns and creepers.

This chain forms the Samoan Islands—mere dots under a tropical blue sky, where sunshine and warm winds caress the glaring beach, the sharp reddish leaves of the mango, and the rustling fronds of the coconut trees. It is a winterless land, but in the spring may come one of the terrific South Pacific hurricanes that level houses and trees and dash great ships on the beach. Such a hurricane occurred in 1889, when three American and two German warships, stripped for action to battle over the possession of the islands, were wrecked with great loss of life.

These nine small islands were probably first seen in 1722, and were named the Navigator Islands by the explorer de Bougainville in 1768. The six most easterly have belonged to the United States since 1900. On the south side of the largest of these, Tutuila, is the splendid harbour of Pago Pago, which has been a coaling station of the



SALVATION ARMY FEEDS THE WORKLESS

Here is one way in which the Salvation Army is lending a helping hand to the unemployed. A free distribution of hot tea and buns is made to men in the queues outside the Labour Exchanges five days each week during the winter months. The van here is seen arriving outside the Hackney Labour Exchange, London.

Courtesy of the Salvation Army

United States Navy since 1872. The larger islands to the west were assigned to Germany when the others passed into the hands of the United States, following a quarter of a century of conflicting claims between Germany, Great Britain, and the United States, and civil war among Samoan chieftains. When Germany was defeated in the World War of 1914-1918, her share of these islands passed to New Zealand as a "mandatory" of the League of Nations.



SCENES IN SAMOA

Though beauty runs riot in the South Seas, the archipelago of Samoa is wellnigh peerless. Top right is a typical planter's home on the islands, protected from the heat by leafy palms. Copra is the main export of Samoa, and above a native labourer is seen cutting the kernels of coconuts which, when sun dried, form the copra of commerce.

Courtesy of New Zealand Government

Near the important port of Apia, on Upolu, one of the former German islands, Robert Louis Stevenson long made his home, and he is buried on Mount Vaea, near his estate of Vailima.

Between the forested mountains of the interior and the sea the natives live in huts, with frail roofs made of pandanus leaves, in which the lizards have their nests. A stone's throw behind them begins a confusion of plants and flowers underfoot, a rank tangle of coconuts overhead, hibiscus, guavas, bamboos, giant ferns, bread fruit, and ironwood, which grows denser and denser until it is finally impenetrable even to the natives, except along the beds of the rushing brooks.

The Samoans are splendid, clean limbed Polynesians with olive brown skins. They are very intelligent and appreciative of education. The total area of the archipelago is only a little more than 1,000 square miles, its population, about 50,000 natives and perhaps 2,000 whites. Copra and cacao beans are the chief articles of export.

Samson. The story of Samson, as it is given in the Book of Judges in the Old Testament, is that of a popular hero of great strength and sarcastic humour in the strife between the Israelites and the Philistines.

On his way to visit the Philistine girl who became his wife the young Samson met a lion and killed it. On his return he found that the carcass was occupied by a swarm of bees. He took the honey, and propounded a riddle to the Philistines:

Out of the eater came forth meat,
And out of the strong came forth sweetness.

With the connivance of Samson's wife they guessed the riddle, whereupon Samson went out and slew thirty Philistines to provide the thirty changes of raiment he had promised them if they could solve the riddle.

His next exploit was to catch 300 foxes, and set them loose in the fields of the Philistines with firebrands tied to their tails. The Philistines in retaliation killed Samson's wife and her household, whereupon Samson smote them "hip and thigh," with the jawbone of an ass. He also carried off the gates of Gaza to Hebron, a distance of forty miles.

Finally the Philistine woman Delilah, whom Samson loved, learned his secret, that his strength lay in his hair. By night she shaved his locks, and betrayed him to her fellow countrymen, who blinded and enslaved him.

But as his hair grew his great strength returned. At a festival of Dagon, the Philistine god, he was led out before the Philistines in the temple. "And Samson said unto the lad that held him by the hand, Suffer me that I may feel the pillars whereupon the house standeth, that

I may lean upon them And Samson took hold of the two middle pillars upon which the house stood, and on which it was borne up, of the one with his right hand, and of the other with his left And Samson said, Let me die with the Philistines And he bowed himself with all his might, and the house fell upon the lords, and upon all the people that were therein So the dead which he slew at his death were more than they which he slew in his life "

Samson is the hero of one of Milton's finest poems, "Samson Agonistes "

Sand. Wind and rain and frost break up solid rocks, decomposing the less stable minerals and leaving the more resistant ones in larger fragments These fragments, rolling against one another through the ages in stream beds or along shores of seas or lakes, lose their rough edges and become gravel and sand The last name applies to the rounded particles of resistant mineral matter, mostly quartz, between about $\frac{1}{16}$ and $\frac{1}{100}$ of an inch in diameter

Dry sand is blown about extensively by wind and deposited as "dunes " Dunes, which are mounds, hills or ridges of wind-deposited sand, are common along sandy shores, and in other places where dry sand is found Dunes abound in many deserts, such as the Sahara, and in semi-arid regions, even in Britain they often reach considerable size, some in Scotland covering large areas of former forest and pasture Unless anchored by vegetation, dunes are likely to



SAMSON AND THE LION

This illustration is one of a series of Biblical drawings made by the well-known French artist Gustave Doré It depicts the youthful Samson breaking apart the lion's jaws "as he would have rent a kid " (Judges, xiv, 5)



SAND DUNES KEPT IN PLACE BY GRASS

Marram-grass, known also as beach-grass, is a coarse grass which, owing to its adaptation to a dry environment, is able to grow amid sand Sand dunes are ever shifting unless steps are taken to ensure their permanence, and marram is largely employed to hold in place with its roots the barrier dunes which otherwise might cease to keep the sea in check.

migrate from the windward to the leeward side of the desert

Wandering dunes may be fixed by artificial barriers, fences, or hurdles, or by planting grass, pine trees, or other vegetation which will grow in sand Both means were employed in the redemption of the "Landes " of Gascony (France), on the Bay of Biscay, where the result has been the planting of the largest Man-made forest in existence

Quicksands ("quick " is here used in the old sense of "living," as in the phrase "the quick and the dead ") are sands in which the grains below the surface slide readily on

SAND

one another, as the dry sand grains do on the top of the beach. Recent investigation of quicksands shows that they consist of a fairly rigid framework of sand particles filled with much water. Pressure or shaking breaks up the framework, releasing the water and forming the treacherous quicksand. Soon after, the sand separates out again, the lattice framework re-forms, and the sand becomes quite solid again.

Sand on the beach in certain places gives a crackling sound, the "singing sands" of Mount Sinai are famous, and the Djebel Nakus or Bell Mountain in Arabia gives forth a sound like a chime of bells, terminating in a roar, which the Beduins attribute to a ruined Christian monastery. There are musical sands, too, at Studland, in Dorset. The cause of these musical sands has been much discussed, and is probably the sliding of grains over one another. In some cases the singing depends on the amount of moisture in the sand. It will not sing if dry or if very wet, but only if just moist. Quartz is the mineral of which common sand is composed, but some sands contain other minerals in abundance, such as magnetite, gold, zircon, garnet, pyrites, feldspar, hornblende, mica, and some other rarer ones. The so-called "white" sands are nearly pure gypsum. "Silver sand" is almost pure quartz.

Under heavy pressure the grains of sand are squeezed close together, and may become cemented by mineral matter, such as calcium carbonate, iron oxide, and silica, deposited from solutions from the waters which percolate through the sand. On cementation the sand becomes sandstone. Sand-stones of various colours and degrees of hardness are much used for building purposes, and also for grindstones and oilstones, those in which larger pebbles and stones are held are often called "pudding stones".

Twenty inches of dry sand will stop an ordinary bullet, and during the World War sandbags were an important means of

defence. The sandblast is a device by which sand is driven through the nozzle of a tube by a blast of air or steam, its uses range from the cleaning of building-fronts and rusted iron to the engraving of glass and the cutting of inscriptions on stone. Sand, besides being used in gardening, is an important ingredient of mortar, cement, and asphalt pavements, and is used in pottery and for moulds in iron foundries. Bricks made of sand are harder and will bear a greater weight than bricks of clay. Sand with a high percentage of silica is demanded for glass-making—the grade of glass varying with the purity of the sand. The size of the grains is important. (See Glass, Quartz.)

SAN FRANCISCO

San Francisco, U.S.A. The valleys of the Sacramento and the San Joaquin rivers meet half way in the State of California to make a thrust westward at the Coast Range, and lo! the wall opens on the greatest landlocked harbour in the world—San Francisco Bay. Enthroned on the southern side of the Golden Gate, guarding this harbour, is the city of



MAIN ARTERY OF SAN FRANCISCO
For nearly a hundred years Market Street, seen above, has been the main thoroughfare of San Francisco. Four street-car lines run along this fine street, which is lined by office buildings, shops and theatres. This photograph is taken from the corner of Powell Street, looking towards the Ferry Tower.

G.P.A.

SAN FRANCISCO

San Francisco Few cities so combine beauty of situation with strategic advantage

Historically the most important Pacific port of the United States, and still among its giants in volume of commerce, San Francisco trades with almost the whole world, but chiefly with the near South and with the Far East

From San Francisco's busy wharves thousands of ships sail annually with cargoes of oil, grain, flour, cotton, tobacco, and canned foods, bringing back silk, coffee, sugar, copra, paper, tea, tin and newsprint The Great Valley east of San Francisco pours grains, fruits, vegetables, wood, minerals, and cattle through the city and is as much a factor in its prosperity as is the broad harbour Slaughtering and meat packing, food canning, shipbuilding, printing and the manufacture of clothing, furniture, and iron and steel products are all important

The great earthquake of 1906, and the fire which raged in its wake over a third of the city, killed about 700 people, left 100,000 to 200,000 homeless, and caused a property loss of £40,000,000 This disaster destroyed many of San Francisco's links with the past, and the old sea-misty buildings of brick and redwood have been replaced by modern structures of concrete and terracotta

'Frisco's Two Wonder Bridges

San Francisco is now served by two magnificent new bridges, which have caused the disappearance of many of the little ferry-boats that plied from the city to its suburbs Across the Golden Gate is a suspension bridge with a single span of 4,200 feet, eastward to the suburbs of Oakland and Alameda, for over eight miles, runs the San Francisco-Oakland Bay Bridge (See illustrations in pages 646-8)

'Frisco's history dates from 1769, when Don Gaspar de Portolá, Spanish Governor of Lower California, stumbled upon the bay by chance while searching for Monterey Bay He named his find after St Francis, the patron saint of the expedition Juan Bautista de Anza escorted colonists and mission fathers there in 1776 The population of the city is 634,000

San Marino. Closely connected with the Italian blood and destiny are the people of the curious little republic of San Marino, which claims to be the oldest state in Europe It is an independent "nation" of 38 square miles near the Adriatic coast, sixty miles south of Ravenna, and with a population of 13,000

It is completely surrounded by Italian soil and is bound by a treaty of friendship to Italy Legendary history states that it was formed in the 4th century by St Marinus of Dalmatia, and certainly its independence was formally recognized in 1631 by Pope Urban VIII The frowning castle and two great towers of the town of San Marino, capital of the republic, look down

SANTO DOMINGO

on scenes little changed since medieval days Winding streets, so narrow that vehicles are rarely used, slant up and down, running between rows of small stone dwellings, many of which seem in danger of tumbling from their perch on the uneven ledges and steep slopes

It has a militia of 950 men, and derives a considerable revenue from its postage-stamps

Santia'go, CHILE One of the most beautifully situated of the world's cities is Santiago, capital of Chile and largest city on the western slope of South America It is situated in a charming plain through which flows the river Mapocho The main chain of the Andes lies not far away to the east, and in the city itself rise several rocky heights, including Santa Lucia, once a citadel but now a pleasure ground

Chief among the broad, straight streets is the Avenida de las Delicias, or Alameda, over 300 feet in width, broken by four lines of poplar trees In the centre is a promenade dotted with lines of statues, while carriage drives or open spaces 100 feet wide lie on either side Along this avenue are to be seen many magnificent residences, built in the old Spanish style round a "patio" (court), with fountains and flowers

There are many beautiful churches and public buildings, including the cathedral, founded by Santiago's own founder, Pedro de Valdivia, and the University of Chile The luxuriant parks in and near the city are maintained by irrigation, for the rainfall is scanty The city has suffered severely from earthquakes

The Trans-Andine Railway connects Santiago with Valparaiso, the leading seaport of Chile (about 70 miles north-west), and with Buenos Aires, the capital of Argentina Santiago is sometimes known as Santiago de Chile to distinguish it from Santiago de Compostella in Spain Population, about 696,000

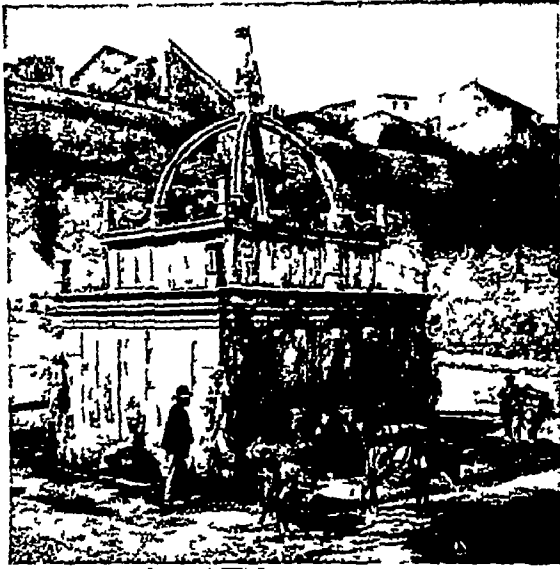
Santo Domingo. This West Indian island is for the most part a mass of snow-capped mountain ranges, precipitous ravines, and broad rivers flowing through twilight jungles Between the ranges lie plains, some of which are the best sugar lands in the West Indies The chief products are coffee, cacao, sugar, and tobacco Copper, gold, and other metals exist, but, like the valuable forests, are still little exploited

The island is some 28,000 square miles in area, and is divided politically between the republics of Haiti (*qv*) and Dominica The Dominican Republic, occupying two-thirds of the island, has an area of about 19,000 square miles, and a population of 1,500,000 The population is mainly a mixed race of European, African, and Indian blood Spanish is the prevailing tongue Its capital, Ciudad Trujillo (population, 71,000) one of the oldest existing European settlements in the New World, founded in 1496, was originally surrounded by

SARDINIA

walls, of which several curious old stone gateways remain. It has been rebuilt since a disastrous earthquake in 1930. The republic's independence dates from 1844, but since 1916 it has been under the tutelage of the U.S.A.

Sardinia. Despite Sardinia's central position in the smiling Mediterranean, despite its ancient history stretching back for centuries before Christ, it remains today a forbidding land. True, the people are honest, courteous, and hospitable, but they are poor and unprogressive. Although the island is a part of Italy, the Italians from the peninsula look upon it as a place of exile. Malaria long raged there, killing a higher percentage of people than in any other part of the kingdom. Comparatively few of the peasants can read and write.



industries. But these are mostly in the hands of foreigners. The short, dark-haired natives, who resemble the Spaniards more than the Italians, dwell mostly on small farms, raising a little grain and herding their cattle, sheep, and goats among rocky hills where wild boar, stag, wild sheep, eagle, and vulture still make their homes.

The Sardinians are believed to be descendants of the ancient Mediterranean race whose stone forts covered the island during the Bronze Age. The first

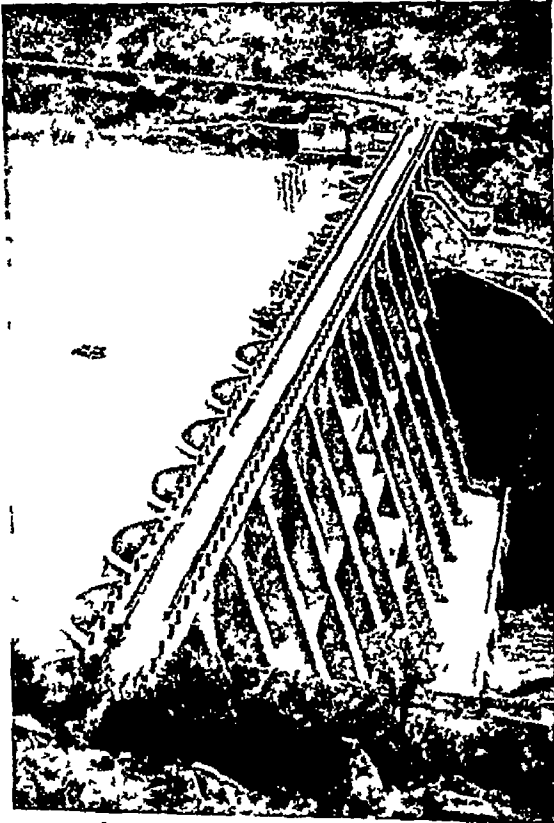
definite history of Sardinia begins with its conquest by the Carthaginians in the 5th century B.C. It later became a Roman province, and was one of the leading sources of the Roman grain supply.

In the Middle Ages the island was the scene of fierce struggles between Saracen invaders and the republic of Pisa. In the 14th century the king of Aragon won it, and it remained Spanish until 1713, when it passed to Austria. Seven years later Austria forced the Duke of Savoy to take it in exchange for Sicily. The island then gave its name to the newly-formed "Kingdom of Sardinia," which included the territories of Savoy and Piedmont. (See Italy.)

Sardinia is 160 miles long and 68 miles wide, with an area of 9,300 square miles. The only considerable stream is the Tirso, 94 miles long, which empties into the Gulf of Oristano on the west coast. On this river are important hydroelectric power works. The highest point is Punta Bianca Spina (6,000 feet) in the centre of the island. The Strait of Bonifacio, 7½ miles wide, separates it from Corsica on the north.

Sardinia is divided into two provinces, named after their respective capitals—Cagliari (pop., 105,000) in the south and Sassari in the north. Its population is about 1,023,000.

Sargent, JOHN SINGER (1856-1925) The spirit and training of many lands combined to make Sargent a famous painter. He was born on January 12, 1856, in Italy of American parents, spoke his first words in German, received



OLD AND NEW IN SARDINIA

In Sassari, chief town of Sardinia after Cagliari, stands the quaint old 17th century fountain seen in the upper photograph. In striking contrast the lower one shows a huge dam across the river Tirso, providing power for industrial needs.

Photos top Alfani bottom ENA



IN SARGENT'S BEST MANNER

Sargent's fine study of Ellen Terry as Lady Macbeth, painted in 1899, was presented to the nation, and is now housed in the Tate Gallery, London. Sargent was first and foremost a portrait painter, and his sitters included many celebrities.

his art education in France, made brief visits to America, and lived from 1885 until his death—April 15, 1925—in England.

Sargent's portraits were perhaps the most notable of their day. His sitters included men and women of distinction in the literary, artistic, and social life of Europe and America, and his portraits in general maintain a wonderfully high standard, for he had the most masterly technique. Often, in fact, his own technical brilliance got the better of him and his pictures became pure exercises in "clever" painting. In water-colours, too, he was brilliant.

Among his portraits may be mentioned those of Ellen Terry as Lady Macbeth (in the Tate Gallery, presented to the nation), Coventry

Patmore (in the National Portrait Gallery), Theodore Roosevelt, and Joseph Jefferson, the actor. The child study, "Carnation, Lily, Lily, Rose," is in the Tate Gallery, and "La Carmencita" is in the Luxembourg, Paris. In America he is chiefly known for his decorations in the Boston Public Library.

Saskatch'ewan, CANADA One may travel mile after mile through parts of the Province of Saskatchewan, in western Canada, and see nothing but the endless fields of waving grain which make it the greatest wheat-growing district of the Dominion. But Saskatchewan covers more than 251,000 square miles, and naturally that large area, extending 760 miles north to south, is not all wheat land.

Of the 94,000,000 acres reckoned to be fit for agriculture, only about 28,000,000 have been put under cultivation. In the south-western region, grain cannot be grown in many seasons.

Extent—251,700 square miles **Population**, about 921,000

Physical Features—Rolling country, rising in the west and broken by low hills, southern prairies separated from the northern forests by a park region interspersed with woodland. Athabaska, Reindeer, and numerous smaller lakes. Principal rivers: Qu'Appelle, Saskatchewan, and Churchill.

Products—Wheat, oats, barley, rye, flax, hay, potatoes, etc., cattle and dairy products, horses, sheep and wool, hogs, furs, coal, cement, and clay products, lumber and timber, flour, packing-house products, foundry and machine-shop products.

Chief Cities—Regina (capital, about 53,000), Saskatoon (41,000), Moose Jaw (19,000).

without irrigation, but stock ranching is exceedingly profitable, and there are many large ranches of from 1,000 to 20,000 acres. Great undeveloped low-grade coal deposits underlie much of the southern portion. In the central part of the province dairying has become so important that the Government has established under the Department of Agriculture a number of co-operative creameries. Between the Saskatchewan and Churchill rivers mixed farming is much more common than the growing of wheat alone, and oats, barley, rye, flax, potatoes, and garden vegetables of the finest quality are raised. The cattle industry is increasing everywhere.

Except where the chinook winds modify the temperature, the long winters are severe. The cold, however, is made endurable by the dryness.

About one-half of the inhabitants are of British descent, and many others are from the United States and various European countries. One of the most interesting groups is the Dukhobors, frequently called "Russian Quakers." They formerly held all their property in common, but have now largely conformed to Canadian conditions. They are pacifists and

non resistants, and do not recognize obedience to government as a duty. In Russia they were persecuted and driven from one province to another, until in 1899 they secured permission, through the influence of Count Tolstoy, to emigrate to Canada. There are now about 15,000 of the sect in Saskatchewan, Manitoba, and British Columbia.

Less than one third of the population live in towns, the chief of which are Regina, the capital (*q v*), Moose Jaw, Saskatoon, and Prince Albert. But as manufactures, especially of lumber products and flour, are beginning to develop, the towns are growing rapidly.

One of the outstanding features of Saskatchewan's agricultural history is the growth of co-operation among the farmers. Flourishing co-operative organizations now exist for the storage and marketing of grain, for dairying, wool, marketing, potato growing, cattle sales, insurance, and purchase and distribution of supplies.

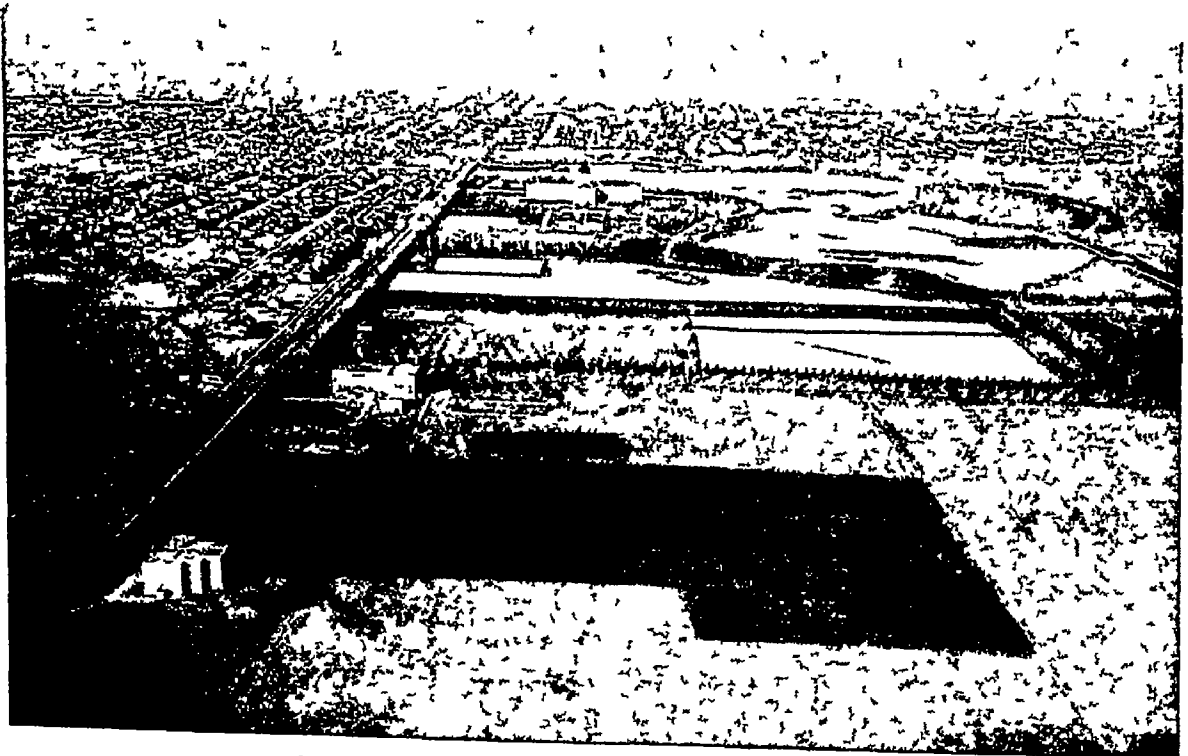
Like the rest of the Canadian North-West, Saskatchewan was originally part of the possessions of the Hudson's Bay Company, and was known as Rupert's Land. The region was still unsettled when it was acquired by the Dominion of Canada in 1869, but with the completion of the Canadian Pacific Railway in 1885 settlers

began to move into the region. From that time onward the population continued to increase, and in 1905 the Province of Saskatchewan, formed from a part of the old territory of Assiniboia, was organized.

The Province takes its name from the river Saskatchewan, and in the Cree language means "rapid river." The river proper (about 240 miles), with the South Saskatchewan, has a length of about 1,100 miles; it flows east through the middle region of the Province, and empties into Lake Winnipeg. Shallow draught steamers can ascend from near its mouth to Edmonton, on the North Saskatchewan, a distance of 850 miles.

Saturn. This ancient Roman deity has been identified with the Greek god Kronos, who, it was said, after being cast out by Zeus, fled to Italy and there established a reign which was known as the "Golden Age of Saturn" (*See Zeus*). The name Saturn comes from a Latin word meaning "to sow," and, unlike Kronos, he was a god of agriculture, who taught his people to till the soil. He is represented with a sickle in his hand. His wife was Ops, the goddess of plenty.

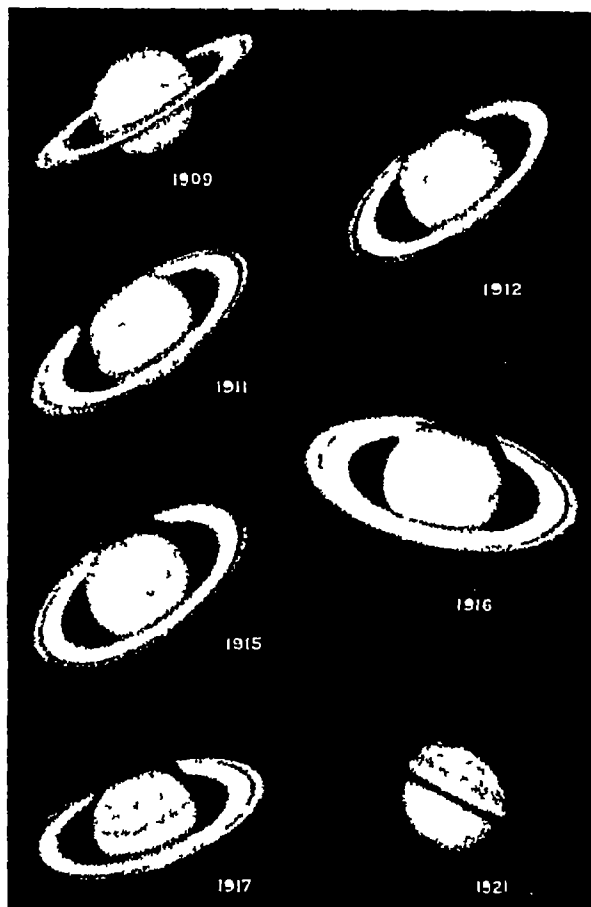
In honour of Saturn a great yearly festival, called the "Saturnalia," was held in December.



'QUEEN' CITY OF FERTILE SASKATCHEWAN

Canadian News Bureau

Regina, an aerial view of which is seen above, is the capital of the province of Saskatchewan. The outskirts of the city, in the foreground, show the rich level agricultural land of the prairie. The white structure in the middle distance is the Provincial Legislative Building, and in the background can be seen the city itself. Saskatchewan is one of the most fertile grain districts in North America, the chief crops being wheat, oats, and barley.



SATURN AND ITS VAST RINGS

Saturn's ring is 171,500 miles in diameter, and is really three distinct rings consisting of particles, about the size of golf balls, moving at over ten miles a second. These photos show the planet as seen from the earth in the years stated.

after the sowing of the winter grain was finished. This was a time of games and feasting, presents were exchanged, including especially wax candles and dolls, distinctions of rank were laid aside, and liberties were allowed even to slaves.

In astronomy, the planet Saturn is the sixth major planet in distance from the sun, and is distinguished by its magnificent system of rings and satellites. (See Planets)

Savonarola, GIROLAMO (1452-98) "Oh, my Florence! I was in a safe harbour—the life of a friar, the Lord drove my bark into the open sea. Before me on the vast ocean I see terrible tempests brewing. The wind drives me forward and the Lord forbids my return. On my right the elect of God demand my help, on my left demons and wicked men lie in ambush. I communed last night with the Lord and said, 'Pity me,

Lord, lead me back to my haven.' 'It is impossible, see you not that the wind is contrary?' 'I will preach, if so I must, but why need I meddle with the government of Florence?' 'If thou would'st make Florence a holy city thou must give her a government which favours virtue.' Then I was convinced and cried, 'Lord, I will do Thy will, but tell me, what shall be my reward?' 'My son, the servant is not above his master. The Jews made Me die on the Cross, a like lot awaits thee.'"

In burning words such as these the Dominican friar, Savonarola, thrilled the pleasure loving people of Renaissance Florence by the tempest of his eloquence. Appalled by the sin of the world—and disappointed in love, so it is said—he had become a friar in Bologna at the age of 22. His first attempts at preaching were failures, but his later sermons in the cathedral of Florence soon gave him a great hold upon that sinful city.

In imagination we can see the shrunken figure and the gaunt face of the little friar, his glowing black eyes flashing like lightning from beneath the shadow of his cowl. His prophetic words concerning the coming "scourge of God" seemed fulfilled when Charles VIII of France crossed the Alps in 1494 and invaded Italy. The emotional Florentines seized the opportunity to expel their despot—the feeble son of Lorenzo de' Medici—and restore their republic, and under the guidance of the prophetic preacher of San Marco they entered into alliance with the French.

Savonarola became practically dictator of the city, and set about his task of giving



SAVONAROLA, REFORMER OF FLORENCE

The Dominican monk, Savonarola, acquired immense influence in the late 15th century as a moral reformer. This painting, by Bargellini, shows him spurning the bribe of a cardinal's hat with which Pope Alexander VI sought to buy his silence. His terrible denunciations of the Pope roused the latter's undying enmity.

National Gallery of Modern Art, Rome. photo Alinari.

SAVONAROLA

Florence "a government that favours virtue" Day by day his impassioned words roused the people to greater and greater religious enthusiasm. Hymns echoed through the streets where lately had sounded riotous songs. In 1497 Savonarola sent the children from house to house to collect the "vanities" of the inhabitants. These were piled high in the public square—the fancy dresses and masks worn at the carnival, and the like—and burned at the close of a solemn procession through the city.

But powerful enemies were now arrayed against Savonarola. The friends of the Medici were plotting their return. Pope Alexander VI ordered the zealous monk to discontinue preaching because of the Florentine alliance with France, and excommunicated him. At the same time a reaction against Puritanism swept over the city. A proposed ordeal by fire between a hostile monk and one of Savonarola's disciples, to test the truth of Savonarola's teaching, came to nothing, after all arrangements were made and the people assembled.

The fickle Florentines now turned against him. His enemies gained control in the elections, the monastery of St. Mark's was stormed, and Savonarola arrested. Through the use of torture they obtained from him whatever confessions they wished, and he was burned to death. The story of Savonarola has been told in George Eliot's novel, "Romola."

Sawfish. Fishermen in warm waters occasionally find the carcass of some sea creature floating on the surface with its body ripped open. This is the work of the sawfish.

These fish are common in tropical seas, and occasionally ascend rivers. Large ones have been said to cut bathers in two. The best known species (*Pristis anti-quorum*) is found in the Mediterranean and the Atlantic, and sometimes measures 20 feet or more in length.

The "saw" is a flat prolongation of the snout, encrusted with a bony layer, the edges of which bear many pairs of sharp teeth, with which the fish tears the flesh from the bodies of its victims. The weapon is sometimes as much as 6 feet long and a foot wide at the base. Their small, weak mouths are set on the under side of the head, behind the eyes, as with their relatives the sharks, which these fish resemble in certain other respects.

SAXIFRAGE



H. S. Cheever

THE SAW-FLY'S SAWS

In this photomicrograph you see the reason for the saw fly's name—the two saws which are formed from parts of this insect's ovipositor. With them it slits open the leaf or twig in which its eggs will be laid, so that the young larvae on hatching shall have no difficulty in finding food.

Saw-flies. You may sometimes come across a tree whose leaves are covered with the strangest looking caterpillars, green or yellow creatures which lift their tails up in the air and wave them about when they are disturbed. These are not really caterpillars, but the equivalent stage in the life of saw-flies, members of one of the groups in the order *Hymenoptera*, whose principal members are the ants, bees, and wasps.

Most of the sawflies are members of the family *Tenthredinidae*, and they do a tremendous amount of damage to trees and shrubs, in the garden, the worst pest is the gooseberry sawfly,

whose little green caterpillars eat all the leaves off the bushes. These insects when adult have four transparent wings, usually without markings of any sort, and their bodies have no narrow waist, such as that which characterizes most of the *Hymenoptera*. They get their name from the saw-like edge of certain parts of the ovipositor, or egg laying apparatus, which is used to cut slits in the leaves or stems, in which the eggs are laid.

Saxifrage. These are amongst the most popular of all plants for the rockery, for some are very beautiful, and most are quite easy for any gardener to cultivate.

As the name implies, they are rock-loving plants—for saxifrage comes from the Latin for "rock-breaker,"



MASSED BLOOMS OF A SAXIFRAGE

Various species of saxifrage are found in the rock garden, where these flowers have always been popular. The masses of bloom you see here are those of one of the finest modern varieties, "ligulata," which bears rose-purple flowers.

SAXIFRAGE

referring to the way their roots split open the rocks. Some are small, grey-leaved plants, others make moss-like carpets on the mountains, and almost all are low-growing, their flowers being borne aloft on erect branching stalks, and some have silvery foliage. The flowers of some are white, while those of others are shades of red, pink, or purple. One of our loveliest wild species is the yellow mountain saxifrage, whose yellow flowers have red spots. Some sorts are so rare as to be confined to the tops of certain Scottish mountains, these often have no flowers but reproduce by means of little bulbils growing out from the stems.

One of the best-known of the saxifrages is London Pride, or St Patrick's Cabbage, which grows wild in the Irish mountains and in high land in Spain.

Saxony, GERMANY
Much of the best of Germany is to be found in the former Kingdom—now State—of Saxony, which lies in the south, on both sides of the river Elbe. Only the picturesque Erzgebirge ("Ore Mountains") lie between it and the former Austrian—and later Czecho-slovakian—province of Bohemia.

Its people are easy-going and kindly. The capital, Dresden (q v), is one of the chief centres of German art, the second city, Leipzig (q v), is world-famous for its university, its book fairs, its music, and its chemical and printing industries, in and about Chemnitz are some of the greatest textile and other manufactures of Germany, while Meissen manufactures the beautiful "Dresden" porcelain and china wares. The fertile soil of Saxony supports a flourishing agriculture, its Merino sheep supply the famous "Saxony" wool, its rich mines produce coal, iron, tin, lead, silver, copper, zinc, nickel, and cobalt, and its water power is abundant.

The population of Saxony (German, *Sachsen*) is about 5,200,000, making it the third German state in population, though ranking only fifth in area. As befits a land which was closely associated with Luther and the Reformation, about 90 per cent of the people are Protestants.

SCALE INSECTS

When the ancient Saxons, typified as a race with fair hair and blue eyes, first appear in history, they were redoubtable sea-pirates, ravaging the coasts of Britain and France from their homes at the base of the peninsula of Denmark.

In Charlemagne's day the parent stock still dwelt by the shores of the North Sea—from the Elbe westward to near the Rhine, and from the sea southward to the low mountains of Hesse and Thuringia. Thirty years of almost incessant warfare (772–803) were required to conquer and Christianize this vigorous people.

Within little over a century afterwards the duke of the Saxons had become king of all Germany, and revived the Holy Roman Empire. And even after the kingship and imperial power had passed to other German lines, the rulers of the Duchy of Saxony were among the most formidable of all the German princes.

But modern Saxony has nothing but its name in common with the old Duchy. Its very situation is different, for it lies at least 150 miles to the south-east, in a "mark" or borderland conquered by the former dukes from the Slavic Wends. After 1423 this territory belonged to the princely house of Wettin.

Saxony was devastated in the Thirty Years' War, but for nearly 70 years (1697–1763) its head was also (by election) King of Poland. It suffered severely at the ruthless hands of its Prussian neighbour, Frederick the Great. It was raised to a kingdom and had its territory increased by Napoleon, and then was deprived of its northern half, to the gain of Prussia, in 1815. It was again obliged to pay an indemnity to Prussia in 1866, for siding with Austria in the war of that year. But Saxony fought on the side of Prussia in the Franco-Prussian War and became part of the German Empire in 1871.

Scale Insects. Some years ago the fruit-growers of California were thrown into a panic by the discovery that immense numbers of insects were devastating their trees, threatening the flourishing groves of oranges and other



CUSHION SCALE INSECTS

Scale insects of various sorts are common in many parts of the world, and often constitute a dangerous pest. Here are twigs attacked by the cottony cushion scale, the insects live beneath the white cottony masses, and suck the sap.

H. Bastin

SCALE INSECTS

fruits with destruction. Experts dispatched to Australia, whence the pest had accidentally been introduced, brought back with them the little red and-black spotted, Australian lady-bird, the natural enemy of this pest in its native land.

When these imported beetles had multiplied sufficiently, numbers of them were sent to the fruit-growers, who liberated them in the groves. By the aid of these beetles and other remedial measures, in less than two years the pest was thoroughly and permanently controlled.

The creature that did this damage is known in the U.S.A. as the cottony cushion scale insect (*Icerya purchasi*), and is one of a number of species

of the group of scale insects (*Coccidae*) which are very injurious to fruit trees, ornamental trees, bushes, vines, and even grasses. They may occur on any part of the stem or leaves, and sometimes even on the roots. They are called "scale insects" because they fasten themselves to a certain spot on the plant, and, with their beaks buried in the tissues of the plant, remain there feeding on the sap, protected and concealed beneath a powdery, cottony, or waxy secretion and various cast-off skins, which form an oval or rounded scale.

The most troublesome scale insect is the San Jose scale (*Aspidiotus perniciosus*), which is believed to have been introduced into the U.S.A. from China, and has proved very destructive in the fruit growing regions.

It does not bother citrus fruits, but attacks many other trees and plants, including the apple, cherry, rose, pear, currant, gooseberry, elm, chestnut, oak, walnut, and many ornamental trees and shrubs.

These scale insects or "mealy bugs," as they are sometimes called, as a rule are stationary, except for a few hours after hatching. The males possess legs and a single pair of wings, but the females lose their six legs after moulting, and thenceforth are grub-like, wingless, and stationary. Immediately the young are hatched they leave their shelter, and rove about on the food plant for a time in search of a suitable place in which to insert their beaks and pump up the sap.



DYE PRODUCING SCALE INSECTS

Not all scale insects are harmful, and the ones seen here are even of considerable value, for they are the insects that produce the valuable red cochineal dye which is made from their crushed bodies. They are seen feeding on a cactus leaf.

cacti), a native of Mexico and other parts of Central America, has long been used for making a red dye (see Cochineal), and in Europe and Asia a few species of the scale insect have been used for a similar purpose for centuries past. The lac insect (*Carleria lacca*) of Far Eastern countries exudes a resinous substance which, when dried, pounded, washed, and purified, becomes "shellac" (See Lacquer).

Scallop. (Pron skol' op) Most "bivalves" soon settle down for life, but many of the scallops are pilgrims, not fastening themselves to rocks or timbers, or forming beds on the bottom of the ocean as oysters do, but



THE SCALLOP AT REST

Here is a scallop, one of the most handsome of shellfish and one that is in considerable demand for the table. The dots along the margin of its body are innumerable eyes. When it wishes to move the scallop flaps its shell and drives itself forward by expelling the water from within.

constantly roaming from place to place. They move by sucking water into their shells and then squirting it out suddenly with sufficient force to push themselves forward in funny little zigzag leaps.

The extensive journeying of the scallop made the shell a fitting emblem for pilgrims, who in the Middle Ages wore it in their hats to indicate that they had taken long voyages by sea. It was especially the emblem of those who had made the pilgrimage to the shrine of St James at Compostella, in Spain. (See illus. in page 3255)

The scallops belong to the family *Pectinidae*, of the mollusc group known as Lamellibranchs, and two of the British species are good to eat. The tender morsels sold in fish markets under the name of "scallops" are merely the bits of muscle with which these molluscs open and close their shells. This is the only part of the scallop that is eaten. Scallop shells are often used as dishes for baking and serving fish, for, besides their useful shape, they are beautifully ribbed, and are remarkable for their bright colours and lovely markings. (See Molluscs)

The RUGGED CRADLE of the VIKINGS

This article tells us the story of a people who, though now divided, were in days of yore a single hardy race of sea rovers, and concludes with the tale of one of their myths

Scandinavia. As a geographical designation the name Scandinavia is applied to Denmark, Sweden, and Norway, the region occupied by the latter two being called the Scandinavian Peninsula. The people of these countries are closely related in blood, language, and history, as well as geographical situation. They belong to the Low German branch of the Teutonic race, and are thus akin to the Angles, Saxons, and Jutes, who formed an important element in the parent stock of the English.

The Scandinavian people have spread beyond the limits of their homelands, colonizing Iceland, which is now united with Denmark under the same king, and Greenland, which is a Danish colony. Elsewhere Scandinavian emigrants have become merged with the peoples of other nations, as in the case of the Northmen who settled in Normandy, England, and Russia, adopting the language and ways of the natives.

From about A.D. 850 Denmark, Sweden, and Norway existed as separate kingdoms, but from the Union of Kalmar (1397) until 1524 they

enjoyed a united government. Denmark and Norway remained united until the Congress of Vienna in 1815. (See articles on the separate countries and map under Norway.)

The kinship of the Scandinavian peoples is evidenced by the similarity of their languages, which are still so much alike that Norwegians, Danes, and Swedes can understand one another fairly well. It was not until about A.D. 1000 that sufficient differences grew up in the parent Scandinavian tongue to form the three dialects which have developed into the Swedish, Norwegian, and Danish languages of today.

The Scandinavians remained for a long time a people of action. The sea was all about them, inviting them to seek fortune and adventure upon its stormy waters, at the same time stern and



P. Væring

ANCIENT SCANDINAVIAN CARVINGS

The old Scandinavian craftsmen were masters of decorative art. In these carvings on the portal of Hyllestad church, in Norway, scenes from Scandinavian mythology, such as Sigurd slaying the dragon Fafnir (top right), are cleverly introduced into the floral design.

SCANDINAVIA

rugged land could not be conquered without a strenuous and prolonged struggle. Scandinavian literature, therefore, begins rather late, and it is only within recent times that Scandinavia has given us writers of world renown.

In the old Viking days, to be sure, tales were told and songs were sung of war and adventure, of gods and heroes, and some of these were later put into writing. Among the oldest important works that remain are the two collections known as the Eddas, of which the Elder or Poetic Edda dates possibly from the 10th and 11th centuries, although the language used was current in the 6th century, and the Younger or Prose Edda from about the 12th century. It is from the Eddas that we get our stories of Odin and Thor and the other gods of northern mythology. Besides the Eddas, there are many sagas—historical or legendary tales first told by the sagaman or story-teller.

The modern period in Scandinavian literature had its real beginning in the 18th century. The Danish-Norwegian dramatist Holberg (1684–1754), who has been called “the Molière of the North,” and the Swedish romantic poet Tegner

(1782–1846) were prominent figures in their own lands, but Hans Andersen of Denmark (1805–1875), the wonderful teller of fairy tales, was the first to become a general favourite, and to be adopted by the whole world. (See Andersen)

Some World-Famous Playwrights

As Andersen showed what the world of fairy-land was like, so other great Scandinavian writers, in the latter part of the 19th century, portrayed the world of reality and delved into the problems of life. To this period belong the Norwegian novelist and dramatist, Björnson, and the Norwegian dramatist, Ibsen. Their Swedish contemporary, Strindberg, possessed great powers, though his work was marred by bitter pessimism. Selma Lagerlöf, of Sweden, through her stories, brought about a return to the world of imagination and romance. But Andersen Nexø, of Denmark, who pictured the peasant life of his own country with great power and fine understanding in “Pelle the Conqueror,” as well as Johan Bojer and Knut Hamsun of Norway, who use more sombre colours, turned again to realistic studies dealing with life as it actually is. (See Ibsen, Björnson, Lagerlöf)

The Apples of Iduna—A Myth of Scandinavia

BEHIND the stormy seas which shut in the homeland of the Northmen were many great mountains, gloomy forests, glittering lakes, and foaming waterfalls. The winters there were very long and cold and dark. The sun hung low in the sky and shone for only a few brief hours in the day. Every waterway was frozen and the land was buried in snow.

The summer came—short, but bright and beautiful. When the snow and ice melted in the spring, and the land grew green under the warm rays of the returning sun, it seemed to those old Northmen that some evil spell had been broken. For they thought that the icy winter was caused by a triumph of the giants of Jotunheim over the gods of heaven.

In Asgard—Home of the Gods

In the shining city of Asgard, where the gods dwelt, there was a palace for wise Odin, king of the gods, and Frigga, his queen, for mighty Thor, the god of thunder, whose magic hammer was ever ready to smite the giants, for Balder the Beautiful, the smiling god of sun and summer, and for all the other great gods and goddesses of northern mythology, and there, too, was the great banquet hall called Valhalla, to which the battle maidens or Valkyries led the spirits of warriors who died heroically.

Among those dwellers in Asgard were also Bragi, the god of poetry and eloquence, and his sweet young wife, Iduna. She was the goddess of youth, the “ever young.” In the light of

her warm, sunny smile no one could grow old. The trees in her garden were always just bursting into bloom, the birds singing, and building their nests, and the dew sparkling on the grass.

Now, Iduna had a magic casket filled with wonderful apples, which the Fates had once allowed her to pluck from the Tree of Life. These had the marvellous power of giving immortal youth and loveliness to all who partook of them. And no matter how many she took from her casket, it was always full when next she opened it. It was these magic apples, distributed at the feasts of the gods, that enabled them to ward off disease and old age, and kept them always vigorous, beautiful, and young throughout the ages. You can imagine how bitterly the dwarfs and giants who had no such magic food longed for the apples of Iduna.

It happened that one day Loki, the mischief-making god, fell into the power of the terrible storm giant Thiazi, and to gain his freedom he promised that he would help Thiazi to steal Iduna and her wonderful apples.

Loki waited until Bragi was gone to earth on one of his minstrel tours. Then he sought out Iduna, who was left alone, and persuaded her to go with him to a grove near Asgard, where, he falsely declared, he had found a tree full of apples even finer than those that she treasured. In order to compare the new apples with the old, Iduna foolishly took along her magic casket. Instantly, as they came out from the walls of



IDUNA AND HER MAGIC CASKET OF APPLES

Iduna, in the Scandinavian legend, was the goddess of youth. She had a magic casket filled with wonderful apples, which the Fates had once allowed her to pluck from the Tree of Life. These apples had the power of giving immortal youth and beauty to those who ate of them, and, no matter how many apples Iduna gave away, the casket was always full when next she opened it. How the envious Loki helped the giant, Thiafi, to steal these apples is related in this page.

From the painting by J. Doyle Penrose R.H.A.

Asgard, a bitter wind blew upon them. The sky was darkened with what seemed the wings of an enormous eagle, but which was really the storm giant, Thiafi. Swooping down, he seized poor Iduna in his terrible claws.

All Asgard was alarmed when Iduna disappeared. Slowly the trees in her garden turned red and gold and brown, and gusty winds blew. Snow lay deep on all the streets and groves of Asgard. The gods and heroes sat over roaring fires in their palaces and tried to keep up their spirits with loud songs and brave stories. But without Iduna's apples they grew old and grey and tired.

At length Bragi found out that it was Loki who had lured Iduna out of Asgard. All the gods and heroes were so angry with that mischief-maker that he promised to do what he could to undo the harm he had so idly wrought.

Borrowing Freya's falcon plumage, he flew off into the bitter North. Loki found Iduna imprisoned in a rocky cave by a frozen sea. She had refused to give the giant Thiafi her apples, and this was her punishment.

Changing her by his magic into a trembling swallow, Loki set out bravely on the return journey, clutching Iduna and her apples tightly in his falcon claws. But the storm giant, Thiafi, was soon in pursuit.

All the gods and heroes were on the walls of Asgard as pursued and pursuer drew near. Their hearts stood still when they saw the giant eagle so close to Loki and Iduna, in their forms of falcon and swallow. Hastily they prepared a great fire on the walls. Loki and Iduna at last cleared the wall and sank exhausted in Asgard. Then the fire flashed up with a mighty flame, killing the pursuing giant.

Restored to her right form, Iduna gave the gods her magic apples to eat, and they at once grew youthful again. The grass sprang up, the trees turned green, the birds came back and sang. Then the goddess leaned over the wall of Asgard and looked down with pity on the cold white earth below, which also lay in the bonds of winter. That, too, turned green and blossomed under her glance. Men in the fields, women in their doorways, and children at play looked up at the blue sky and said to one another: "Iduna has come back to her garden. The earth is young again and spring is here."

Schiller, JOHANN CHRISTOPH FRIEDRICH VON (Pron shil'-er) (1759-1805). Ten years before the birth of Napoleon, this great German poet was born in the Duchy of Wurttemberg.

When Schiller was a very little boy, he had made up his mind to be a preacher, but when he was eight years old his father moved to the

capital where the Duke of Württemberg lived. Here was a theatre, to which the boy was often admitted as a reward for industry, and he became so fond of it that instead of playing at preaching he began play-acting with his sisters. When the Duke established a military school at his castle, "The Solitude," near Ludwigsburg, Schiller as a bright pupil was invited to enter it. At first Schiller studied law, but later he was allowed to study his father's profession, medicine. Here he remained until he was 21, when he was appointed a regimental surgeon.

While Schiller was at "The Solitude" he wrote his first play, "The Robbers." He wrote it in secret, frequently pretending to be ill in order to find time for writing. Every publisher to whom he applied refused it, and he finally borrowed money and had the play printed at his own expense. It was received with great enthusiasm. "The Robbers" deals with two brothers, Karl and Franz. Franz, the younger brother, is jealous of the elder, and succeeds in duping his unsuspecting father and brother by means of forged letters in which he shows each to the other in a false light. Karl is disgusted with the wickedness and injustice of society, and, like Robin Hood, he becomes a leader of a band of outlaws, who avenge the oppressed. Throughout the play runs the cry for liberty. In the end Karl discovers that his attempts to right wrongs by committing new wrongs, to enforce the laws by lawlessness, and to correct violence by violence, are but criminal folly.

For the next seven years Schiller struggled along, writing several plays and receiving small compensation for his literary products. But he was gradually attaining renown. Then a friend introduced him to the young Duke of Weimar, to whom he read part of one of his plays. The Duke showed his pleasure by making Schiller one of his councillors. This position led to his appointment as professor of history at Jena University in 1789. With the little income he now received he was enabled, in 1790, to marry Charlotte von Lengefeld, a sweet, lovable young woman. Soon after he formed an intimate friendship with the great Goethe (qv), and in 1799 he removed to Weimar, partly in order to be near Goethe, who was director of the theatre at Weimar. On May 9, 1805, he died at Weimar, one of the best loved and famed of German poets.

The two best-known plays of Schiller's are "The Maid of Orleans" (1802) and "William

Tell" (1804), the heroine of the former being the French peasant girl, Joan of Arc. He was also the author of many famous ballads and lyrics, including "An die Freude" (To Joy), incorporated by Beethoven in his Ninth Symphony. **Schliemann, HEINRICH** (Pron shlé'mahn) (1822-1890). More than a century ago a little boy in the small German town of Neubuckow in Mecklenburg sat on his father's knee listening to the wonderful tale of Troy and the great heroes who had fought there. But of this ancient and glorious city, his father told him, not a trace of it remained.

When little Heinrich Schliemann was old enough to read the story himself, he pondered over his father's words, as he gazed at a picture of Troy in flames. At last he said: "Father, if the walls were really so strong and thick, something must be left of them. Some day I shall go to Troy and find the buried city."

Schliemann never forgot his dream of rediscovering Troy. It was in his thoughts when, as a grocer's apprentice, he was dealing out herrings and butter or running errands. He remembered it when as a cabin boy he sailed for



JOHANN VON SCHILLER

This fine painting of Germany's great dramatist, by Frau Ludovika Simanovitz, shows Schiller at the age of 35. The reflective character of his poetical idealism has a peculiarly national appeal. The upper photograph shows Schiller's birthplace at Marbach in Württemberg.

Photos top German Rlys Bureau bottom Bruckmann

Venezuela, and when, after a wreck, he was employed as clerk in an office in Amsterdam. In the meantime he managed to learn several foreign languages.

At last prosperity came to him. He engaged in the indigo trade and acquired such a fortune that at the age of 36 he was able to retire and devote himself to his long-cherished dream. In 1870 he set out at the head of a large body of labourers for the desolate region about Hissarlik

in Asia Minor, which he had long believed and now proved to be the site of ancient Troy. Even more rich and interesting than he had expected were the remains he found here. After devoting several years to this work, he crossed over to the mainland of Greece and excavated the prehistoric cities of Mycenae and Tiryns, bringing to light the splendid remains of a vanished civilization of 3,000 years and more ago. (See Aegean Civilization, Trojan War)

GOING to SCHOOL through the AGES

The school is one of our oldest institutions, though it is only in the last sixty years or so that national education has developed to its present importance. Nowadays, schoolchildren are better off than ever before.

School Every civilized nation realizes that there are no more important institutions in the world today than schools. There was a



'A Village School'

time when governments left it to parents to decide whether or not children should go to school, but now the law requires that all children shall receive a certain minimum of education.

In the Middle Ages the English monasteries became great centres of learning, and people came to them from all parts of the world.

Various Latin writers were now read, and music and the fine arts encouraged. In the 14th and 15th centuries grammar schools were built by wealthy men in different towns. In 1373 William of Wykeham, Bishop of Winchester, founded Winchester College, and in 1440 King Henry VI founded Eton College (qv), most famous of all "public schools" (See below, page 3606).

Then came a period of neglect, but this was followed by a great reawakening of interest in education, during the Revival of Learning or Renaissance (qv). In 1510 John Colet founded the famous St Paul's School in London, and introduced better methods of teaching and a wider scope of study, which included Greek and Latin (the classics), Music, Art, and Religion. Colet's example was followed by many wealthy men, and other schools were built, but in the reign of Henry VIII much of this good work was destroyed. Monastic and grammar schools were closed, and the king seized for himself the lands which had been given for their support.

Edward VI, however, was gentle and studious. He founded Christ's Hospital (the "Blue-Coat

School") and several of our other great public schools, as well as numerous grammar schools. In many towns schools are now called King Edward Grammar Schools, to remind us of this period. All these schools were for the sons of middle-class people only.

In 1780, however, Robert Raikes of Gloucester founded Sunday Schools (qv) for poor children, and these grew so rapidly that in 1800 there were Sunday Schools in all parts of England. At the same time many private and country "dame" schools were started, but these were often badly managed and charged high fees with very poor results. Joseph Lancaster, a Nonconformist teacher, next came into prominence. He started a school in St George's Fields, London, which was very successful, and he afterwards formed the British and Foreign School Society, which built schools everywhere. Dr Bell, who inspired Lancaster, also now established the National Society, under the auspices of the Church of England.

No Education for the Multitude

For a long while these two societies did splendid work in developing education, but there were still too few schools to meet the needs of the people. All these schools were supported by voluntary subscriptions, but, where the money was not forthcoming, the buildings, teaching, and equipment were of very poor quality. Children had to pay a weekly fee, and those who could not pay were not taught. Under these conditions many people had no education at all, and so could neither read nor write.

All this was changed by the Education Act of 1870. Gladstone was then Prime Minister, and the Bill was presented by W. E. Forster. It was the first great national movement in England for the reform of schools. By its provisions education became compulsory, and every child had now to attend school.

The existing schools were, of course, totally inadequate in number, and money was voted

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for new schools. In every area bodies of men were elected to look after this development, and these were known as School Boards. The new schools were called Board Schools, to distinguish them from the National Schools already existing. The maintenance of these schools was charged to the local authority in part, and this amount was increased by government grants paid each year after the schools had been inspected and reported upon by government officials. The necessity of securing good reports led to great improvement in teaching methods and equipment, and alertness soon pervaded the previous dull atmosphere that had characterized the educational world.

to that time National Schools had worked independently of Board Schools. The former had a separate body of managers, who were responsible for the maintenance of fabric, equipment, payment of staff, and so on, their funds being obtained by local subscription and grants. In the same way the School Boards were responsible for their schools, but all these bodies were independent, and each had its own method of administration. The Act of 1902 chiefly provided for unity of administration. It grouped numbers of schools under a central authority. Every town of importance formed an Education Committee, and county areas did likewise for urban and rural districts.



WHEN GRANDMAMMA WAS AT BOARDING SCHOOL Wallace Collection

Deportment and polite accomplishments were the main items in the curriculum of what were termed "seminaries for young ladies" in late Hanoverian days. Here is George Morland's painting of a great lady visiting her daughter at a school of this sort. It clearly indicates the etiquette laid down for such an occasion.

The Act of 1870 was the Magna Carta of education, and from that time onward developments were rapid and effective. School fees were still charged, being collected by the weekly payment of a few pence. In 1891 school fees were abolished, and in England and Wales elementary education is now compulsory from 5 to 14 or 15 years of age.

A growing desire for further education was met by the establishment of Higher Grade Schools, Technical Schools, County Schools, etc., classed as Secondary Schools. These were usually the result of special efforts of certain districts, and the cost of them was treated as a local charge.

In 1902 an Education Act was passed which coordinated the administration of schools. Up

The Existing System
Today Great Britain claims to possess the finest educational system in the world, and we are proud to speak of the "Educational Ladder" up which, at very little cost, our children can proceed step by step from the schools to the universities.

Children go first to a *kindergarten* (*qv*) or nursery school, where they are taught simple "lessons" for a few hours every day, or to the "infants" department of a Council school.

The next stage, from the age of 6 or 7, is the *elementary school*, a category which includes the junior school, run by the State, and the "private preparatory school" for the children of more well-to-do parents—preparing for the *secondary school*. The great division at most "prep" and secondary schools is between day-boys and boarders. Fees for the latter are, of course, very much higher.

The secondary school may be regarded as covering the intermediate stage of education, and takes children from the age of 11½. State



languages) and a science side. A Careers Master has been appointed in some of our larger schools. It may be noted here that details on careers will be found appended to many of the articles in this work.

"Public Schools" are not really public, but, on the other hand, are practically reserved for the sons of wealthy or at least well-to-do people, though originally many of them were founded for poor boys. They are the

(Council) schools of this kind are graded as secondary, central, and senior schools. Then there are grammar schools and public schools, to which there are money scholarships for particularly clever pupils. Other boys and girls must pass some sort of entrance examination, the commonest of these is the Common Entrance.

At a secondary school, the curriculum of subjects and their teaching is based almost entirely on the exams set by the authorities—the School Certificate, in particular, the securing of which sometimes gains "exemption from matric." Matriculation merely means registration at a university, and is the name of an examination set by the University of London and other universities. (See also Examinations)

When about half way through a secondary school career, a boy or girl must decide what he or she intends to do in after-life, and accordingly "specializes" by studying the most suitable subjects. Nowadays many schools have a classical side, a modern side (including modern



SCHOOL-TIME IN DIFFERENT CLIMES

The neat efficiency of the Lapland school (top), with its separate desks and trimly rolled maps, is in marked contrast to the primitive open-air bush school in the British Cameroons, Africa, seen in the lower photograph. In this you see the boys being taught to add with the aid of pegs. The language difficulty is overcome by the use of pidgin English and signs.

schools—150 in number—whose principals meet annually in the Headmasters' Conference.

In public schools for boarders, the "house" system is general. Each house is largely self-contained and self-governed, with its own housemaster and his lieutenants, the prefects, in charge. The prefects often have power to punish the "rank and file," and may be allowed the services of junior boys as "fags" (See Fagging). The routine of school periods,

TRADITION IN FAMOUS ENGLISH PUBLIC SCHOOLS



Most of our public schools have their particular traditions and ceremonies. The top left photograph shows the ceremony of 'Calling Bill' on Founder's Day at Harrow. The boys file past the master, in Bill Yard, to answer their names as he calls the roll. The room in which the "collegers" or scholars of Winchester do their private study (top right) is called Seventh Chamber, and the little cubicles are known as "toyes." All hats must be hung up on the partitions of the "toyes." Below, a master is "calling Absence" at Eton—the first item on the agenda on Speech Day, June 4.

Photos: top left Keystone top right Central Press bottom "The Times"

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games, and "prep" for the next day is carefully balanced so as to develop both the mind and body without overstraining or neglecting either. Inter-house rivalry forms a basis for teaching and learning the "team spirit" on the playing field—one of the most important lessons for every boy and girl. Though some may regret it, it is a trait of youth to regard a 1st XI or 1st XV colour with far greater respect than a "brain" of the Upper Sixth!

Most of the boys and girls who enter the universities (Oxford, Cambridge, London, etc.) are already on the threshold of manhood or womanhood, and their education and existence there are a preparation for the battle of life. (See the article on Universities)

There has recently been a growing interest in, and attendance at, night schools or evening classes such as are run by the London County Council. Here people of all ages can "go back to school," and learn anything from engineering to pottery. For those who have newly left school, of course, there is an enormous variety of schools training young men and women in specialized careers or professions.

For children, the BBC's series of broadcasts for schools are a new and important influence. Although there are few examples



SELF-INSTRUCTION FOR CHILDREN

In some American schools children are encouraged to teach themselves, the teacher merely seeing that they acquire knowledge in their own way. Here a teacher is helping a child to follow the words with his finger while another reads aloud.

SCHOOL GARDENS

of the co-educational school in Britain, the "co-ed" system universal in the USA., in which boys and girls go to school together, forms an interesting comparison to the traditional "monastic" ways of education in the Old World. Parents' Advisory Committees, now attached to many of our schools, are another notable innovation.

There are very few "school stories" that are both true to life and good literature. "Tom Brown's Schooldays," by Thomas Hughes, Kipling's "Stalky & Co.," and Talbot Baines Reed's "Fifth Form at St Dominic's," however, are established classics.

How to Become a Teacher

The largest branch of the teaching profession consists of those who teach in the elementary schools, and the usual way of becoming a teacher in one of these is to enter a training college where education is combined with practical work in instructing classes of children. Some intending teachers take a course that lasts three years and ends with a degree, but the majority leave after two years. These remarks apply to women equally with men.

Those who wish to enter a training college must have passed one of certain recognized examinations, and be over the age of 18 on the first day of the academic year for which he or she is admitted. A list of these colleges can be obtained from the National Union of Teachers, Hamilton House, Mabledon Place, London, WC1.

To become a master or mistress in a secondary or public school, a university degree is essential, except in the case of teachers of certain specialized subjects such as physical training. At one time this qualification, especially if coupled with a certain skill in athletics, was regarded as sufficient, but today many headmasters like their assistants to have passed through a course of training in a college for teachers, and this is equally true of the mistresses in schools for girls. (See also Education)

School Gardens. Wherever you go to school, you are almost certain, sooner or later, to learn something to do with gardens, and many modern schools have special gardens kept by the boys and girls of each class.

These gardens are not provided merely to teach you about flowers and plants, in them you may learn the whole routine of gardening from preparing the soil to reaping the fruits, about insects and other pests that attack the growing plants, about the ways of making the soil better, or preparing it for special crops, and, above all, to take an intelligent interest in outdoor things.

Competitions between school-gardeners all over the country help to keep them up to scratch, and there is always, too, the knowledge that after months of labour they may take home

with them their flowers or fruit or vegetables that they have grown themselves

Yet though gardening is perhaps more practised as a hobby in Britain than in any other country, organized school gardens were started not here but in Schleswig-Holstein, as long ago as 1810. They were prescribed by law in Austria and Sweden fifty years later, and thereafter they spread all over Europe. Now school gardens and garden work are an important part of school life in most civilized countries.

Schubert, FRANZ PETER (Pron shōō'-bärt) (1797-1828) "Whatever his eye beholds, whatever his hand touches, turns to music"—so another famous composer wrote of Schubert, the world's greatest song writer. In his short life of only thirty one

years—a life of continual poverty—he produced more than 600 songs, many of them as simple in their beauty as folksongs, and others full of dramatic intensity, all poured forth from a heart filled to bursting with music.

The son of a poor schoolmaster in Vienna, Schubert showed his love for music at a very early age, and his family gave him what encouragement they could. When little Franz was five, his father taught him the violin, and an elder brother gave him lessons on the piano, until they could teach him nothing more. Little Franz—then aged seven—was sent to the choir master of the parish church, but the latter, after a few years, found that he, too, could teach his marvellous pupil little, and could only listen to him in wonder and admiration, amazed at his precociousness.

Then, when he was 11, he entered the chief music school of Vienna, which trained the choir of the Austrian court chapel. By the time he was 13 he had already begun to compose, his only difficulty was in obtaining enough music paper on which to write down his melodies.

Victim of Overwork and Poverty

Before he left the Vienna music school, at the age of 17, Schubert had composed a symphony. But though his friends recognized his genius, the publishers feared to accept the work of an unknown musician, and it was not until his 24th year that any of his works were printed. He supported himself as best he could by teaching, but many of his greatest songs realized less than a shilling, and the most that Schubert



SCHUBERT, GENIUS OF SONG

This intimate sketch by Wilhelm Rieder is judging by contemporary descriptions, a striking likeness of Franz Schubert, the world's greatest song-writer. In addition to writing between six and seven hundred lovely songs, Schubert also wrote symphonies, piano and chamber music, and dramatic and choral works despite the fact that he died when he was only thirty one.

received for any composition was £20! With his strength impaired by overwork, poverty, and disappointments, Schubert was unable to fight the illness which overtook him, and he died in his 32nd year.

He wrote overtures, sonatas, symphonies (including the immortal "Unfinished"), string quartets, operas (including "Rosamunde"), cantatas—almost every sort of composition, in fact. He composed also much beautiful church music, but it is for his songs that Schubert is chiefly remembered and loved. He could scarcely read a poem without putting it to music. Goethe's poetry inspired a great many of his songs, among them the famous "Erl King." Among other favourites are the "Serenade," "Impatience," and the beautiful Shakespearean songs, "Hark! the Lark!" and "Who is Sylvia?"

A modern musical play called "Lalac Time," with Schubert as the chief character, introduced many of his songs.

Schumann, ROBERT (1810-1856) When, at the age of 20, Robert Schumann was making the great decision as to what should be his life work, he wrote to his mother, "My whole life has been a struggle between Poetry and Prose, or call it Music and Law." His father, a prosperous publisher in the German industrial town of Zwickau (in Saxony), had died, and his mother wished him to study law, as she thought it a more certain profession than music. For this purpose she sent him to the University of Heidelberg, where he remained for two years, but

she yielded to her son's desire when she found that his whole soul was absorbed in music

It was Schumann's ambition to become a great pianist, but while practising according to a method which he himself had devised, he crippled one of the fingers of his right hand so badly that he was compelled to give up all hope of ever excelling in that line. In the end the world profited by his misfortune, for it led him to devote all his attention to composing, and as a composer he gained very high rank.

The romantic feeling which runs through most of Schumann's work is a reflection, in large measure, of the romance of his own life. He fell in love with Clara Wieck, daughter of his music teacher, who was a charming girl and also a remarkable pianist.

During the years when he was trying to win her, and in the year after she became his wife, Schumann composed some of his finest music, which includes many masterly compositions for the piano, three symphonies, and about 150 songs. Among these last may be mentioned "Ich grölle nicht," "Im wunderschönen Monat Mai," "Die beiden Grenadiere," and "Du bist wie eine Blume."

Schumann's life should have been very happy, but for a shadow cast over it by an inherited tendency to melancholia. His wife's tender care and sympathy helped him through several attacks, but finally, in a fit of insanity, he attempted to drown himself in the river Rhine. He was rescued, but died a few months later in an asylum near Bonn, at the early age of 46.

Schumann had a very great influence on the musical art of his time. For a number of years he edited a musical journal, and through his criticism encouraged the best in music. He was among the first to recognize the great genius of Brahms, Chopin, Berlioz, and other rising composers.

Science. When you were a little child you spent much of your time in learning facts about things around you. You felt them with your fingers, your lips, your tongue, you tasted them, you listened to the sounds they made, you lifted them. In short, you used all your senses to find out as much as you could about them.

It was a very mixed-up lot of facts you learned. Sugar was sweet, mother's silk dress was nice to touch, milk had a pleasant taste, the mug made a bang when it was dropped, and many such facts you added to your store day by day.

Soon you began to sort these facts in your mind. Some of them were very similar, if you let go of a penny it fell, your spoon dropped to the floor when it was pushed off the table, and a hundred other such facts were put together. So you came to the notion at last that all things fall when dropped. This for you was a beginning of science, for science grew in just this way. Men first observe facts, sort them, so as to put together those that seem related, then by thinking on these things reach broad truths that cover many facts.

As a child you went on in your belief that all things fall when dropped. Of course, you did not state this law to yourself in any such way, but when you dropped a thing you looked for it on the floor, not on the ceiling. You simply acted on your belief.

Then one day, perhaps, you had a toy balloon and you let go of it. That did not drop, but went up. It may have been many months or even years before you found enough other facts of the same sort to help you to understand that if a thing is lighter than air it does not drop but rises instead. So you gradually added to your scientific knowledge.

Now men have found out a great deal more about falling bodies than simply that they fall. They have watched them and timed them and measured how hard they hit the ground, and so on, until they have found out certain laws of falling bodies. They have found that the apple attracts the earth as well as that the earth attracts the apple, and they have also discovered the laws of their mutual pull.

And so science grows. Science is simply all the knowledge of facts that men have found out as certain and have put in order so that they can use it to find the fixed order of things and the relations of cause and effect. These they call the natural laws.

This knowledge is now so great that no one mind can master the whole of science. A



ROBERT SCHUMANN

Leader of the early Romantic school of German composers, Schumann, Bendemann's portrait of whom is seen above, was second only to Schubert as a composer of songs. He had a never-failing gift for melody, apparent also in his compositions for the piano.

single library, however, may have on its shelves hundreds or thousands of books full of scientific knowledge, so that you can easily find out about anything you may want to know

Science as a whole is divided into many parts, each a science in itself. Biology is the science that deals with life and living things. In turn it is divided into Botany, the science of plants, and Zoology, the science of animals. These are again divided. A man may devote his life to the study of birds and then not know all there is to be known about them. Ornithology is the science that deals with birds. Geology deals with the history, structure, and changes of our earth. Physics deals with such forces as heat, light, and electricity, and with the matter things are made of. The history of the races of men and of Man as a whole (known as Ethnology and Anthropology respectively) are sciences, and so are Grammar and Geometry. Indeed, to name all the sciences into which knowledge is divided would take pages of print.

The results of scientific discovery are made use of in countless arts and professions which are usually classified as *Applied Science*. Among these are Medicine, all forms of Engineering, Agriculture, Navigation, etc.

But science has not only put in order a mass of knowledge, it has also shown that the scientific method of thinking is very important. This may be stated briefly as thinking to correct conclusions on a basis of tried and true facts, thus saving unnecessary labour and economizing in thought.

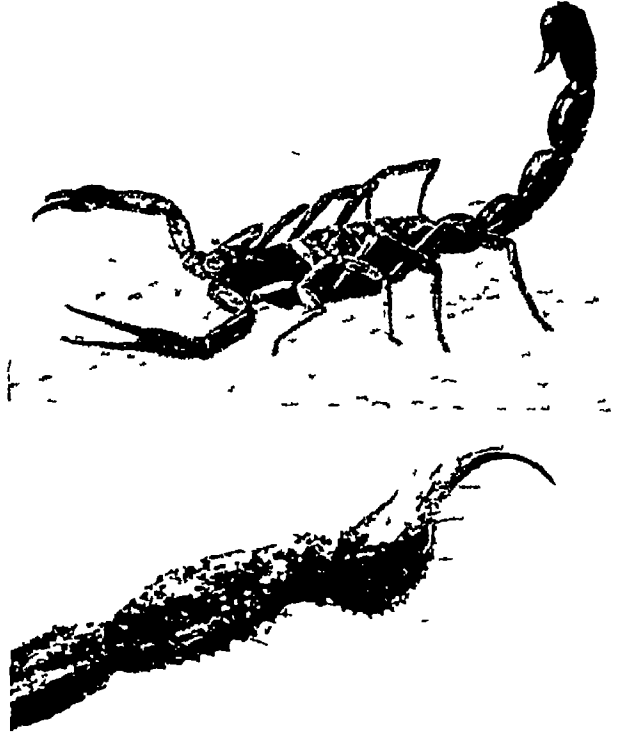
An illustration will help to make this clear. When the people of the United States occupied Cuba years ago they had to make the island healthy, for it had been a centre of the deadly yellow fever, which had been spread from Cuba to various ports by sailors and other travellers. No one knew the cause of yellow fever or how it was spread.

So doctors went to Cuba to get all the facts they could as to when it occurred, where, among what kinds of people, and so on. They found, among other things, that it was very common in swampy regions. That made them think that the germ of the disease might be carried by mosquitoes, in the same way as malaria was then known to be carried.

The idea was worth testing. So mosquitoes in little cages were allowed to bite persons afflicted with the yellow fever and again, later, persons who were quite well. These were

soldiers and doctors who offered themselves for the test. They one and all caught the disease. Soldiers slept in swampy regions screened so that no mosquitoes could get in, and they did not take the disease, even when they slept on beds in which persons had recently died of yellow fever. All these facts convinced the doctors that the mosquito carried the germ of yellow fever. (See *Germ Theory of Disease*, Mosquito.)

This problem was solved by collecting facts, making a guess as to the solution, collecting more facts by experiment to test the guess, and reasoning on all these facts to arrive at a correct judgement. This is a typical scientific method of attacking a problem.



THE SCORPION AND ITS STING

Here is a most unattractive specimen of animal life, a poisonous scorpion. In the upper picture you see its general shape. It looks like a cross between a spider and a lobster, with a long curling tail in the tip of which is the sting, seen enlarged in the lower photograph.

Photos: F. Martin Duncan

Scorpion. Scorpions are near relatives of the spiders, for with them they belong to the eight-legged *Arachnida*. But on account of the two pairs of claws which come in front of the legs, they look more like tiny lobsters with very slender tails.

At the end of that tail—which is not a real tail, but merely a narrow continuation of the body—is the scorpion's chief distinction—his sting, a very hard, sharp, curved needle with a tiny hole near the tip through which he pours the poison stored in the last joint of his body. When a scorpion has clutched his prey in his great powerful claws, he curves his tail over his head and plunges the paralyzing sting into the helpless creature. The poison is sufficient to

kill small creatures and to cause human beings much pain, it may even kill a person who is in a bad state of health when stung

These creatures are very widely distributed over the world, being found in deserts, in tropical forests, and sometimes even where there is snow. They range from 1 to 8 inches in length. During the day they lie hidden under stones and logs, or in holes, and are rather slow and torpid, but at night they are very quick and active. Their food consists of small insects, spiders, lizards, toads, slugs, snails, and even small mammals, such as mice and shrews. They are not vicious unless disturbed and very seldom do harm to human beings, while they obey Nature's "fair play" law by having, in many cases, the "warning" colours, black and yellow. Some kinds burrow in the soil.

The mother scorpion brings forth her young alive, and carries them about on her back for some time. The baby scorpions resemble their parents when born, and shed their horny skin several times as they grow up.

Scorpions have lived for a long time on the earth, for fossil remains, differing but little from modern types, are found in coal deposits of the Carboniferous period.

But these are by no means the earliest representatives of the family. In marine Silurian deposits—in Scotland, for instance—remains have been found of scorpions which apparently lived in the sea. These sea-scorpions probably had poison fangs and could inflict a sting just as severe as that of their land-dwelling cousins, but they were tiny creatures—never more than 2 inches long, and often measuring only 1 inch.

LOVELY LAND of LOCHS and GLENS

Containing the most impressive scenery in the British Isles and some of the busiest industrial areas, "Bonnie Scotland" is twice blessed. No wonder that from her have come so many heroes and leaders of men.

Scotland. The northern part of the island of Great Britain has been known for a thousand years as Scotland. It is divided geographically into three parts, the northern Highlands, the central Lowlands, and the southern Uplands.

The northern Highlands average about 1,500 feet above the sea, and are mostly heather-covered rocks

where nothing useful can be grown, but where the eye is constantly entranced by the beauty and grandeur of the scenery. In the little valleys between the hills a few sheep are pastured. Over much of the country the red deer can still be stalked, and grouse and other game shot. On and after the "Glorious Twelfth" (August 12) each year there is an invasion of sportsmen from the south.

The Lowlands form fairly good farming country, where oats, wheat, barley, and other crops are grown, and where a considerable dairying business is carried on. The Scottish people are good farmers and know how to make economical use of their land. In few parts of Europe has farming improved so rapidly in the last century as in the Lowlands of Scotland. The southern Uplands are less fertile, and, though various crops can be grown, sheep-raising is the chief occupation in this part of

Extent—30,405 square miles (of which 609 sq. m. are water). *Population* 4,482,000.

Physical Features—Mountainous Highlands in the north, central Lowlands, and southern Uplands. Chief ranges—Grampians (rising to 4,406 ft. in Ben Nevis), Sidlaws, Ochils, and others in the north and centre; Moorlands, Pentlands, Lammermuirs, and Cheviots in the south. Principal rivers on the east, the Tweed, Forth, Tay, Dee, Don, Spey, and Esk; on the west, the Clyde and the Firth. Largest fresh-water lochs—Lomond (27 sq. miles), Katrine, Tay, Earn, Awe, Ness, and Maree.

Principal Products—Oats, barley, wheat, turnips, potatoes, dairy products, sheep, cattle, horses, herring and other fish, coal, iron, shipbuilding, granite and other stone, linen, jute, wool, cotton, tweeds, plaids, whisky.

Chief Cities—Glasgow, 1,119,000, Edinburgh (capital), 464,000, Dundee, 175,500, Aberdeen, 175,000, Paisley, Greenock.

the country. Famous breeds of native live-stock include the Clydesdale horse, Ayrshire cattle, the black-faced sheep of the southern Uplands, and the little Shetland pony.

The coast-line of Scotland is very irregular, the western part having a rugged fringe of "firths," peninsulas, and islands. The Orkney and Shetland

Islands, to the north, and the Hebrides (qv) or Western Isles are parts of Scotland.

The greater portion of the mainland is mountainous. The rugged Grampian Mountains (average height, 2,500 feet) separate the Highlands from the Lowlands and have at their western extremity Ben (Mount) Nevis, Scotland's and Britain's highest peak (4,406 feet). Southward are lesser peaks and groups, of which Ben Lomond (3,192 feet), although not the highest, is perhaps the most famous. Along the southern edge of the Grampians, in the counties of Perth, Angus, and Kincardine, is the great Valley of Strathmore. The Cheviot Hills (highest peak, 2,658 feet) lie on the English border.

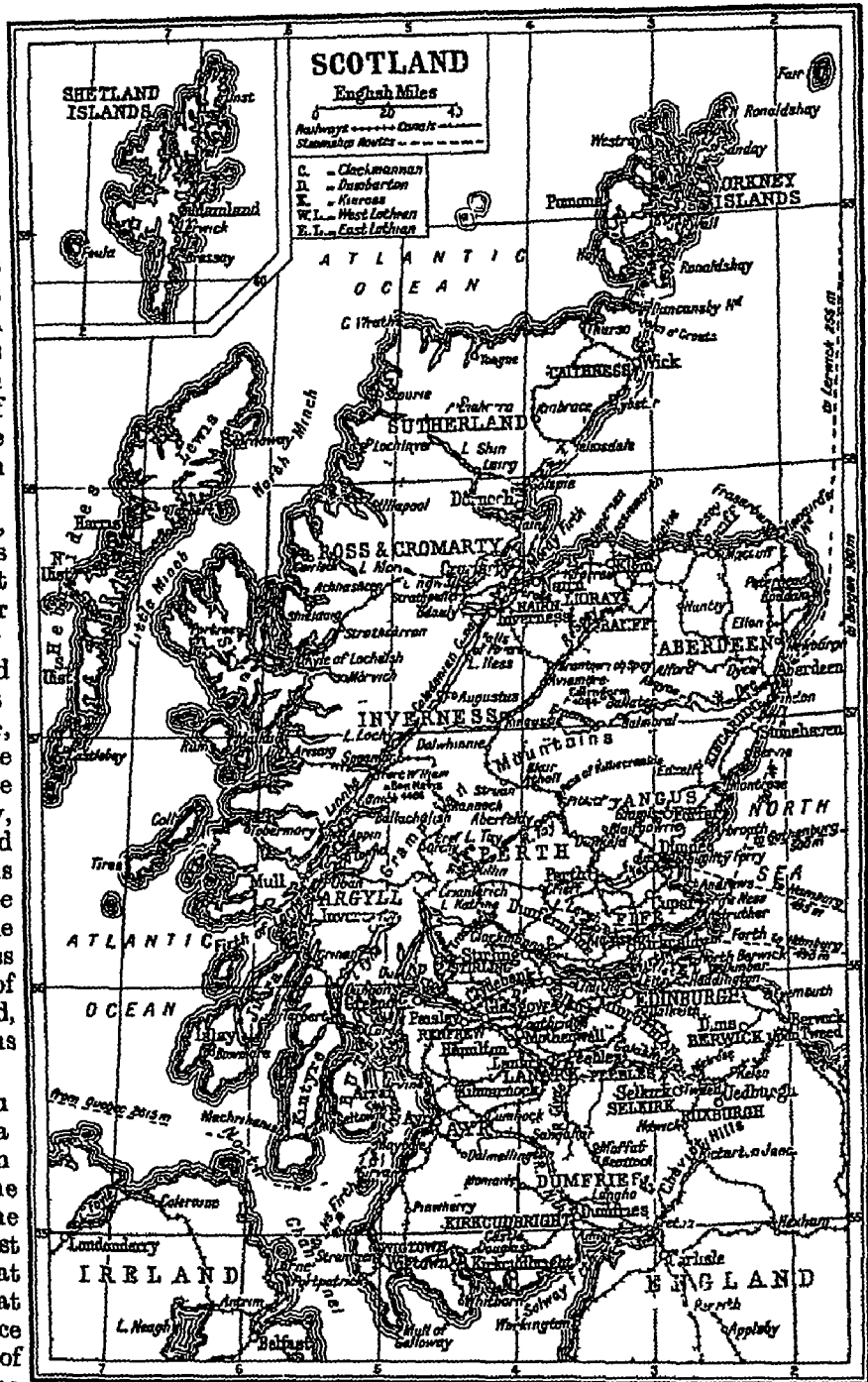
Scotland is dotted with numerous lakes, of which beautiful Loch Lomond is the largest and most famous in song and story. Near by are a group to which tourists come from far and wide—Lochs Katrine, Achray, Vennachar,

SCOTLAND

and Lubnaig, and the pass of the Trossachs Loch Ness and Loch Lochy, with their connecting waters (along the line of Glen More, which divides the mountains of the Highlands), were joined in 1803 by canals with locks, so as to make a continuous waterway (the Caledonian Canal), 62 miles long across northern Scotland, from Moray Firth, an arm of the North Sea, to the Firth of Lorne, which opens to the Atlantic. Vessels of 500 to 600 tons, usually fishing boats, pass through the canal, and it is a favourite route for tourists in the summer

The climate is influenced by the very indented western coast line. Here, where the mountains come right up to the sea, the rainfall is naturally heavy, but Scotland's "bad weather" reputation is rather unjustified, as the climate is on the whole more bracing and less treacherous than that of England, though Scotland, being further north, is colder in winter.

Nearly half the population today is concentrated in a small district centring in Glasgow (qv), the great factory city of the south west and the largest city of Scotland. In that neighbourhood are great coal mines that produce about 40,000,000 tons of coal a year, and on the Clyde great shipbuilding industries have grown up, the most important in the British Isles. Machinery, jute, linen, wool, and many other things are also manufactured in this neighbourhood and elsewhere in Scotland. Travelling southward from Glasgow, on the LMS main line, one passes great massed factories, the smoke of which obscures the sky. Whisky, preserves, and chemicals are important manufactures, in addition to textiles and iron and steel. Porridge and oatmeal are famous Scottish breakfast-table foods. Fishing—for herring, haddock, cod, skate, and halibut—is carried



on all round the coasts Besides Edinburgh (the capital, *qv*) and Glasgow (*qv*), important cities are Dundee (*qv*) and Aberdeen (*qv*)—both on the east coast and on the main line of the LNER from Edinburgh to Inverness—and Paisley, Greenock, and Motherwell, all in the Glasgow and Clyde area. The LNER line just mentioned crosses the Firths of Forth and Tay by two world famous bridges

The Scots people have little good land, the rainfall over most of the country is so great as to interfere with agriculture, and the arms of the sea and the mountains cut off the various parts

SCOTLAND

of the country one from another. Few countries have conquered such natural disadvantages. The Scots are an industrious, clever, and thrifty people, and not only build ships for other nations but man them. It is said that, in any part of the world, if you go below the hatchway of a ship to the engine-room and call out, "Mac, are you there?" an engineer will poke up his head and answer in broad Scots!

It is also said that the road a Scot likes best is the highway to London, and it has been true for a century—and is more true now than ever—that much of the best young talent in Scotland comes south to London, and that

for athletic supremacy or takes part in a reel with his bagpipes (*See also Clan*)

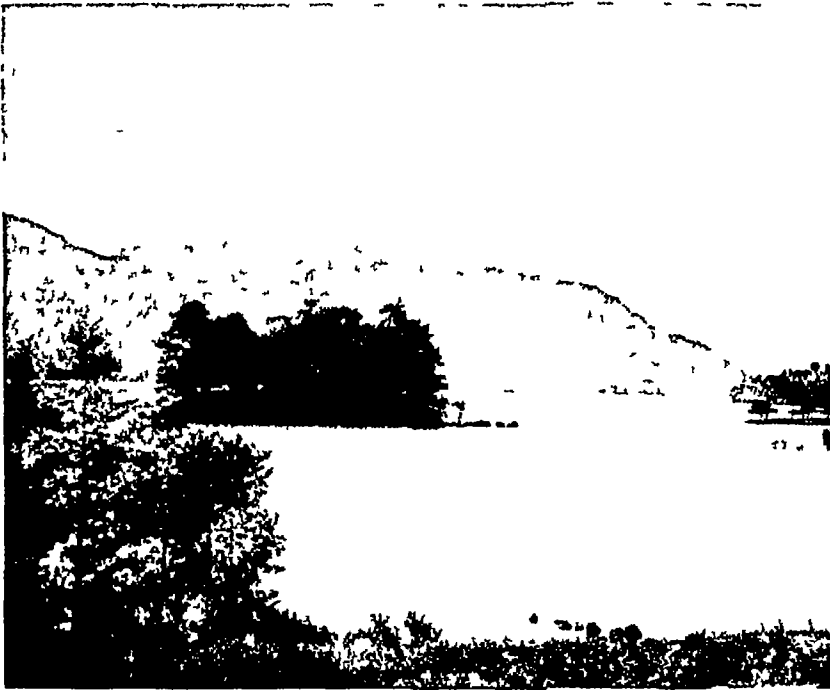
Scotland's early history is a tangled web of tribal warfare and clan struggles. The Romans, who built a wall across Scotland in the hope of keeping the Picts from raiding the Lowlands, never conquered the Caledonians or Picts, who inhabited this part of Britain. At the end of the 5th century a people called Scots came from Ireland and settled in western Scotland, and in the 9th century Picts and Scots united in a single kingdom under Kenneth MacAlpine, king of the Scots. When the Normans conquered England, the successors of William of

Normandy made claims to feudal lordship over the kings of Scotland, but these claims remained vague. Many famous Scottish families are descended from the Normans, such as the Douglasses and the Hamiltons, and probably the Stuarts themselves. Richard Coeur de Lion sold his claim upon Scotland for money to go Crusading. Edward I of England took advantage of the disputes between heirs to attempt to unite Scotland with England. His plan was statesmanlike, but took no account of the Scottish patriotic spirit. Sir William Wallace resisted him at Stirling Bridge and became the great hero of Scotland. Wallace was, however, defeated at Falkirk (1298), and was finally captured and put to death in London.

Robert the Bruce, grandson of one of the earlier claimants to the throne, renewed the war,

and after many adventures (*see Bruce, Robert*) was able at Bannockburn, in 1314, to drive the army of Edward II headlong back into England. Scotland thus regained her independence, and in the wars which England fought against France in the 14th and 15th centuries (*see Hundred Years' War*) Scotland sided with the French. Many a young Scotsman went to seek his fortune in the French wars. We read of one such in Scott's "Quentin Durward." The body-guard of the French king for several centuries was composed of Scotsmen. There were many border battles, in most of which the Scots got the worst of it, Halidon Hill (1333) and Flodden Field (1513), two of the most famous of these battles, are renowned in song and story.

Scotland, under the lead of John Knox (*q v*), early adopted the Calvinistic or Presbyterian form of the Protestant religion, but Mary Queen



'BONNIE, BONNIE BANKS OF LOCH LOMOND'

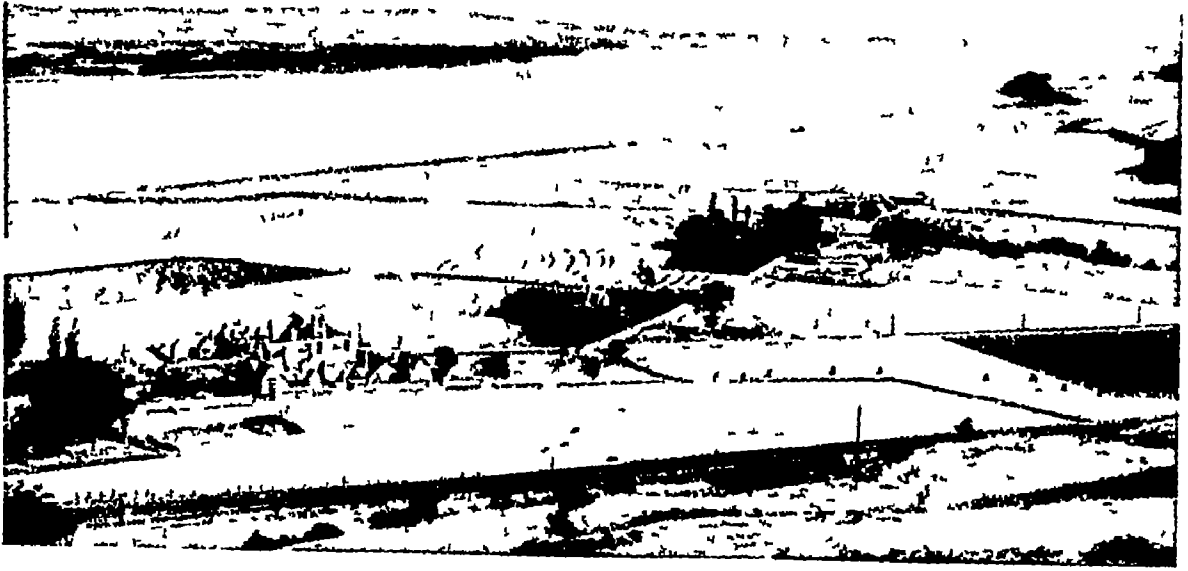
Loch Lomond, above, is the largest lake in Great Britain, being twenty-four miles long and up to five miles wide. Set between Stirlingshire and Dumbartonshire, amid mountain scenery of great beauty, it bears on its broad waters some thirty islets, of which the largest is Inchmurrin.

Scots talent recruits English business and politics. The Scots have gone also—and continue to go—to the colonies and to America.

Racially it is hard to distinguish the Lowland Scot from the northern Englishman, they look alike and talk much alike, and have the same manners. Probably the Scots are descended more largely than the English from the early peoples who spoke Celtic dialects, but they have some Saxon and Danish ancestry and more Norman ancestry than has sometimes been assumed.

The real Highlander, however, is quite a different type. He speaks Gaelic—an ancient Celtic tongue as unintelligible to a Lowlander as to an Englishman. Tall and strong, wearing the tartan kilt of the clan to which he owes allegiance, he makes a fine figure of a man in the picturesque Highland Games as he strives

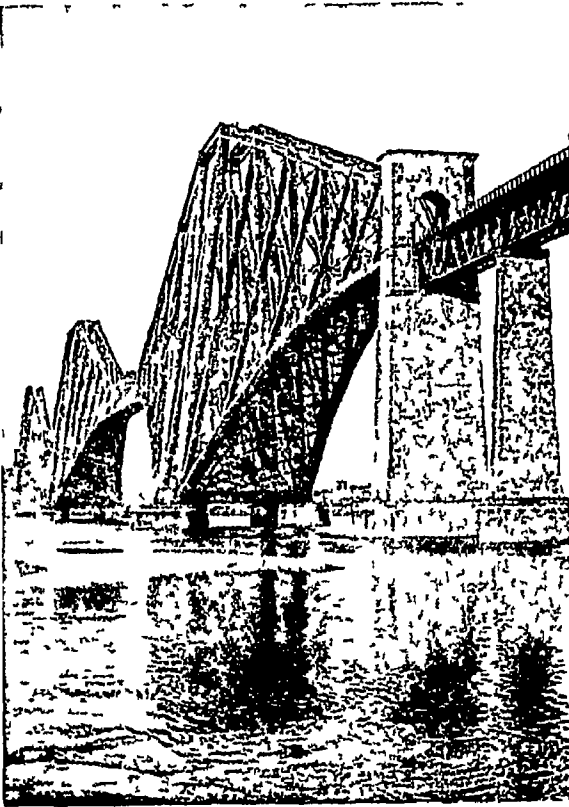
SCOTTISH SCENES IN LOWLANDS AND HIGHLANDS



The upper photograph gives a typical view of the Lowlands of Scotland, showing Newburgh, in Fife. The view is taken looking down the Firth of Tay, and shows a flat fertile, agricultural landscape. In contrast, the majestic scenery of the Highlands is well shown in the lower photograph, which gives a lovely panorama of the Breadalbane Range, in Perthshire, seen from the summit of Ben Lawers. The mountains are for the most part rocky and barren, cut by deep, narrow glens, but they afford some of the most picturesque scenery in Europe, especially beautiful when the heather is in flower.

Photos top Wm F Taylor bottom Robert H Adam

SCOTLAND



Topical

THE FAMOUS FORTH BRIDGE

Though the famous Forth Bridge was completed as long ago as 1890, it is still one of the engineering wonders of the world. The total length, including approaches, is one and three-quarter miles. This bridge carries the main Edinburgh-Aberdeen railway across the Firth of Forth.

of Scots remained a Roman Catholic and had a claim to the throne of England. She was driven out of Scotland into the hands of Elizabeth of England, and was eventually executed (*See Mary Stuart, Queen of Scots*). Mary's son, James VI, was brought up in the Presbyterian faith. On Elizabeth's death he succeeded to the throne of England also, as James I, uniting the crowns of the two nations but not the governments.

When Charles I, son and successor of James, attempted to impose upon Scotland the English episcopal form of religion, a servant maid named Jenny Geddes threw a stool at the ritualistic preacher in St. Giles's Church, Edinburgh. There soon began the successful Scottish rebellion, or Bishops' Wars (1637-39). The advance of the victorious Scottish army to English soil made it possible for the Puritan party in England to maintain the stand of the English Parliament against Charles I. Eventually the Scottish army and that of the Parliament took the field against Charles (1642). When Charles was forced to place himself in the hands of the Scots after the Battle of Naseby (1645), they turned him over to the English.

His execution in 1649, however, produced a reaction in Scotland, and his eldest son was welcomed in Edinburgh as Charles II. Cromwell

marched into Scotland, defeated the Scottish at Dunbar (1650), drove Charles II out, and governed Scotland as a conquered nation. The restoration of Charles II in 1660 gave Scotland again separate government. The overthrow of the last Stuart king, James II, in 1688-89, was disapproved of in the Highlands, and for a century afterward there were adherents of the fallen Stuarts in that part of the country. Twice, in 1715 and 1745, there were formidable "Jacobite" uprisings. Many of Scotland's finest roads date from this period, when General Wade was in charge of the English troops (*See also Pretender*). The Act of Union in 1707 brought Scotland and England under one government, and from that time the Scots began to appreciate more that love of law and order and peace which had become characteristic of the English Kingdom.

An admirable elementary and secondary school system was early established largely under Knox's inspiration, while the Scottish universities of Edinburgh, St. Andrews, Glasgow and Aberdeen hold high rank among the educational institutions of the world. During the 19th century Scotland underwent a great industrial



D. MacLellan

MEMORIAL TO A SCOTTISH HERO

On Abbey Craig, overlooking Stirling, stands this impressive monument to Sir William Wallace, the great Scottish patriot of the 13th century. A man of vast strength and infinite courage, he did much to restore order and unity to his country. His name is immortalized in Burns's poem "Scots wha hae."



D. McLeish

WOODED GLEN OF THE TROSSACHS

The Trossachs (meaning bristly country) is the name given to a wild gorge of enchanting beauty leading from Loch Katrine to Loch Achray in Scotland. It was in this district of "Caledonia stern and wild" that Sir Walter Scott laid the scene of his famous poem, 'The Lady of the Lake.'



Francis Caird Inglis

STIRRING SKIRL OF THE PIPES

In costume and calling the piper stands for racial traditions ever dear to the heart of the patriotic Scottish Highlander. On occasions of ceremony, the piper's kilt, the plaid over his shoulder, and the ribbons on his bagpipes, are of the tartan of his clan or regiment. Each Scottish clan has its own distinctively patterned tartan.

SCOTLAND

change Coal and steam, railways and machinery, re shaped the land The Scots took to machinery and to the mammoth industrial organizations that followed in its wake Scotland became more important than it had ever been before, and its population increased enormously Great hydro electric power schemes have been launched in recent years

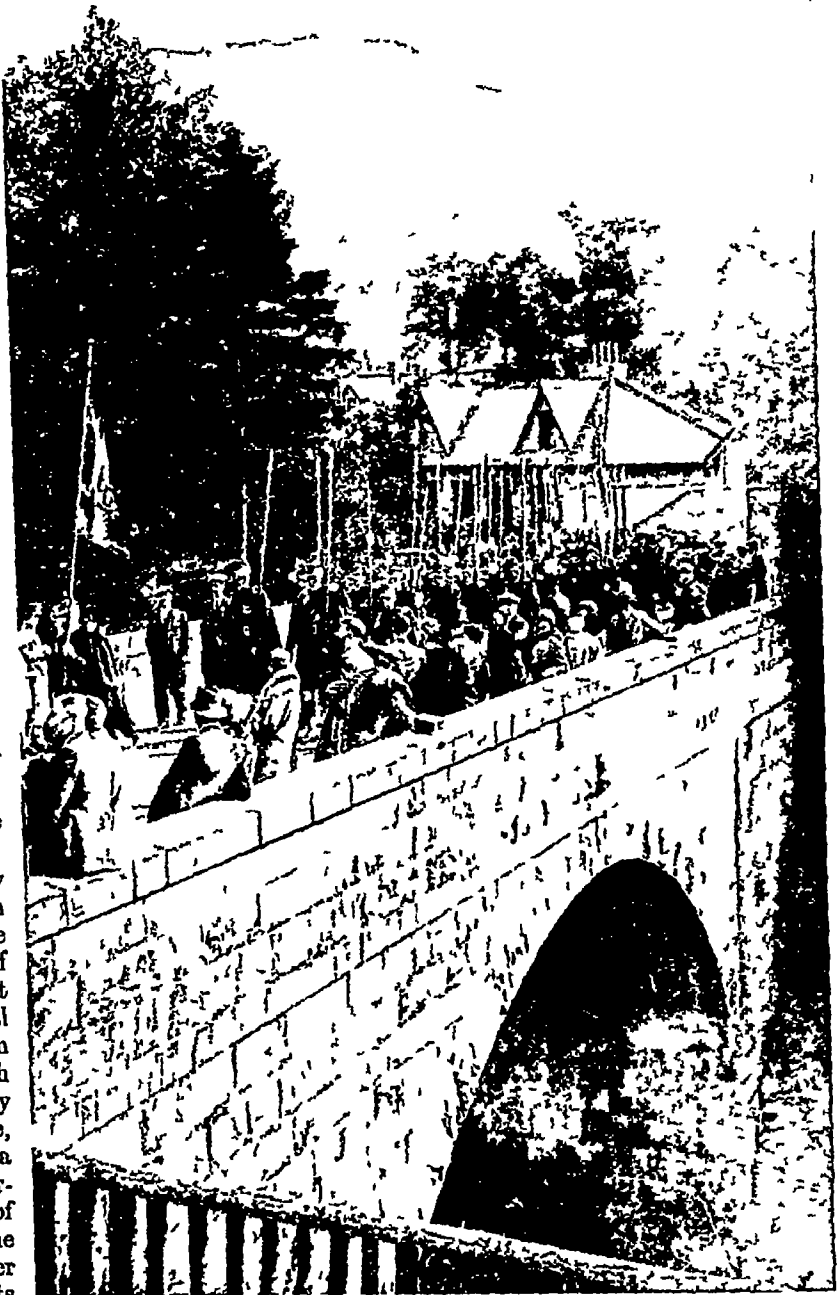
Queen Victoria's preference for her northern realm as a summer residence was much appreciated in that country, and the same sentiment is shown today when the King and Queen (who is herself a Scot) visit Balmoral or Glamis Castle More and more Scottish born politicians have found careers in the Parliament at Westminster, and the past 50 years of British history give colour to the saying that the "Scots rule England"

While the Scots today love to recall Sir William Wallace and Robert the Bruce, it is because of their feeling for the past and not from any national feeling against union with England—although Scottish Nationalism is by no means a dead cause, and many want to see a separate Scottish Parliament The poetry of Robert Burns and the romances of Sir Walter Scott have given the Scots a deep pride in their country, and raised the esteem for Scotland all over the world, and in such matters as local government, their national Church (Presbyterian) and law, they are as individual as one could desire

In a general way the Scots seem to be a practical people, perhaps more interested in business and politics than in artistic activity Yet they have been a nation of theologians and metaphysicians, and the visitor to Edinburgh finds the statues of their great theologians on every

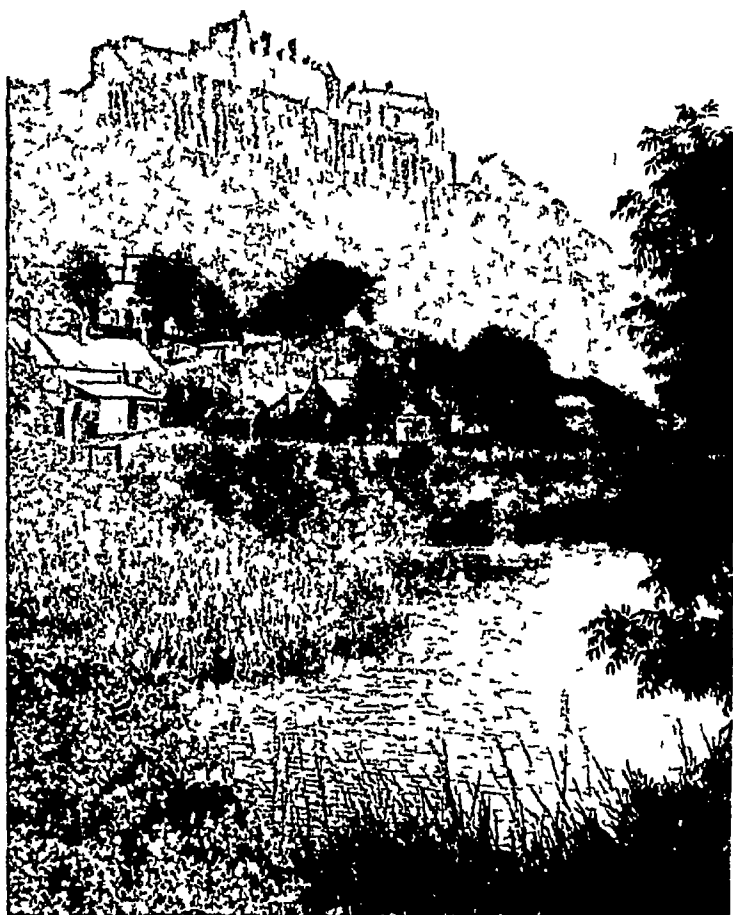
corner The reason for the large number of Scotsmen who make a success of life may be found in the fact that knowledge and reading are widely diffused in Scotland

THE SCOTTISH OFFICE Under the direction of the Secretary of State for Scotland (a Cabinet Minister) is this Government department with offices in Whitehall, London, and at Edinburgh



ASSEMBLY OF SCOTTISH CLANS

The village of Braemar, seen above, is in the Deeside highlands, in south-west Aberdeenshire In a park near the village is held the famous annual Braemar Gathering for Highland Games. Our photograph shows representatives of the various clans taking part in the games marching in procession through the streets of the village.



'BULWARK OF THE NORTH'

D McLeish

High up on a rock, on the right bank of the River Forth, stands Stirling Castle, former residence of the Kings of Scotland. It lies at the centre of no fewer than seven battle-fields on which Wallace and Bruce fought invading armies. Within its precincts are the Palace, the Chapel Royal, and the old Gothic Parliament House.

In local government, Scotland employs terms all its own. For instance, there are Royal, Parliamentary, and Police Burghs, each with a Town Council. The chief officials are called the Provost (or Lord Provost) and Bailies, whose positions correspond to those of Mayor and Justice of the Peace in England. The whole Scottish legal system is different from the English, and a verdict such as "Not Proven," which is final and decisive in Scotland, would be impossible in England. The Church of Scotland is, of course, governed on the Presbyterian system—by Kirk (Church) Sessions, Presbyteries, Synods, and the Church Assembly. In 1929 the United Free Church of Scotland re-joined the Established Church.

(See also the separate articles on each of the Scottish counties, and on the large cities.)

Scotland, LANGUAGE AND LITERATURE OF The literature of Scotland is an elastic term, since it may mean the literature of the Gaelic language, or the literature written in Scottish dialect, or literature in English written by men and women who are Scottish by birth. Since

the literature of the Gaelic language is small in bulk and little known even in Scotland, we may confine ourselves to Scottish dialect literature, and then glance briefly at the contributions of Scotsmen to the great body of literature expressed in the English tongue.

First, a word about the Scottish dialect. This differs widely from standard English, both in pronunciation and in vocabulary. In some words letters are dropped in the Scottish pronunciation: thus the *l* is dropped from *all* (pronounced *aw*), *hall* (pronounced *haw*), etc. In others, the aspirated guttural (*ch* as in *loch*) has been retained where modern English now has *f*. Examples are *laugh*, *draught*, *trough*. Scottish pronunciation here follows the spelling much more closely than does English.

In its vocabulary, Scotland has kept many words that have fallen out of common English usage. The words *brickle* meaning brittle, *clout* meaning patch, *leasing* meaning lying, *mote* meaning a splinter or particle, are in common use in Scotland, though they have fallen out of favour in England since they were used in the Authorized Version of the Bible in 1611. The Scottish dialect has also many words that have never been part of the English language. Several of them are derived from French, and are interesting survivals of the "Auld Alliance" that long existed between Scotland

and France. A few examples of such words are *ashet*, for a dish (French *assiette*), *pownie*, for a peacock (French *paon*), *tassie*, for a cup (French *tasse*), *armrie*, for a cupboard (French *armoire*).

The earliest specimens of Scottish vernacular literature are fragments of minstrelsy, dating from the thirteenth century. The first Scottish poet known by name was the minstrel Thomas of Erceldoune, called Thomas the Rhymer, who lived during the thirteenth century. In the following century lived John Barbour, who wrote the great epic of "The Bruce." The fifteenth century was a busy period for Scottish poets, many of whom followed the traditions of Chaucer and hence are known as the "Scottish Chaucerians." The greatest of them was William Dunbar, whose best-known works are "The Thistle and the Rose" and "The Lament for the Makaris." Towards the end of the century Gavin Douglas translated the "Aeneid" into Scottish verse.

In the centuries that followed there was a dearth of Scottish poetry, though many books were written in prose, such as John Knox's

"The History of the Reformation" The next important Scottish poet was Allan Ramsay (1686-1758), whose best known work is "The Gentle Shepherd" After Ramsay there was a revival of song writers, one of whom, Robert Fergusson (1750-1774), passed on the torch of inspiration to Robert Burns (qv), whose works are the crowning glory of the Scottish dialect Burns has, by his very eminence, overshadowed the achievements of many lesser, but still considerable poets, such as James Hogg (the Ettrick Shepherd), Lady Nairn, and Allan Cunningham At the present day there are still poets who prefer to express themselves in the vernacular rather than in standard English, prominent among them are Charles Murray, John Buchan, Violet Jacobs, and Hugh MacDiarmid

In English literature, Scotsmen began to assume a prominent place in the eighteenth century with David Hume, the philosopher, and Adam Smith, the economist In the same century Boswell's "Life of Johnson," the novels of Smollett, and the poems of James Thomson

won a fame that still abides In the early nineteenth century the name of Sir Walter Scott (qv) stands high above all his contemporaries Lesser men of his time who also became famous were J G Lockhart (1794-1854), Scott's son in law and biographer, John Wilson ("Christopher North", 1785-1854), W E Aytoun (1813-1865), author of "Lays of the Scottish Cavaliers", and John Galt (1779-1839), whose masterpiece is "The Annals of the Parish" Later in the century Thomas Carlyle dominated the intellectual life of London

Quite different, and much more attractive, was the outlook of R L Stevenson (qv), whose tales, poems, and essays are still widely admired The Stevensonian tradition was most ably maintained by Neil Munro and John Buchan (qv), while Stevenson's popularity passed in full measure to Sir James Barrie (qv), the creator of Peter Pan Among the most successful of contemporary novelists may be mentioned Naomi Mitchison, Compton Mackenzie, A J Cronin, Eric Linklater, and A G Macdonell

IMMORTAL STORY of CAPTAIN SCOTT

In the annals of great British adventurers the name of Captain Scott stands high, for, in addition to his triumphs as an explorer, he died a hero's death, and set an example of fortitude that will last for ever

Scott, ROBERT FALCON (1868-1912) On March 29, 1912, three men lay dying in a little tent, far away in the frozen Antarctic Continent—three heroic men who had been to the South Pole On their way back they had been caught by a fierce blizzard within eleven miles of a depot in which food and fuel awaited them While the gale beat and howled outside the flimsy shelter, their leader raised himself in his sleeping bag and in a feeble hand wrote these words "We shall stick it out to the end, but we are getting weaker of course, and the end can not be far It seems a pity, but I cannot write any more —R SCOTT" Some time later he added the last entry, "For God's sake, look after our people"

So ended in tragedy the English exploring expedition under Captain Robert Scott, which had gone out two years before with such high hopes

They had reached the South Pole, indeed, on January 18, but were not the first to do so, for Roald Amundsen (qv), the Norwegian explorer, had arrived there on December 18, 1911, a month earlier

The story of the desperate struggle to cover the 1,800 miles from the Pole back to their base, as told in Captain Scott's diary, and by his second-in-command, Lieut E R Evans (later to become famous as "Evans of the Broke") in his book "South with Scott," is one of the most heroic and pathetic narratives in history, you will find a brief account of it overleaf

Scott entered the English Navy at 14 as a cadet In 1901, in the *Discovery* (now anchored in the Thames and used as a Sea Scouts' training ship), he headed an expedition to the Antarctic which discovered King Edward VII Land, and did notable scientific research work



ROBERT FALCON SCOTT

This simple monument to the great British explorer was executed by his widow, and stands in Waterloo Place, London It was erected by officers of the Fleet as a token of their admiration for their fellow sailor

SCOTT

His second and last expedition started in 1910 in the Terra Nova. It also accomplished much valuable research work. Captain Scott's records were recovered when his body was found eight months after his death. There in the everlasting snows a cairn has been raised, and a cross surmounts the last resting-place of this most gallant explorer and his equally gallant

companions. In Cambridge his memory is perpetuated by the Scott Polar Research Institute. The King conferred posthumously the K C B upon Scott, whose widow thus became Lady Scott. Their son Peter has made a name for himself as a painter of wild birds. In 1922 Lady Scott—who has achieved distinction as a sculptor—married Sir E. Hilton Young.

Triumph & Tragedy in Scott's Last Venture

NO story in the whole history of exploration has so stirred the hearts of all who have heard it as that of Captain Scott's tragic expedition to the South Pole. There is no parallel to this amazing record of endurance, of tremendous hardships, of the devotion of man to man, and of all to the cause they had embraced, which drove Scott's party on, through unimaginable perils and difficulties, through a series of sheer mischances against which no forethought could have availed, until at last they arrived at the Pole, and there has perhaps never been a tragedy so intense as that which dogged the footsteps of those five storm-battered, terribly wearied, heroic men, as, bitterly disappointed but still undaunted, they struggled back until they were struck down, one by one.

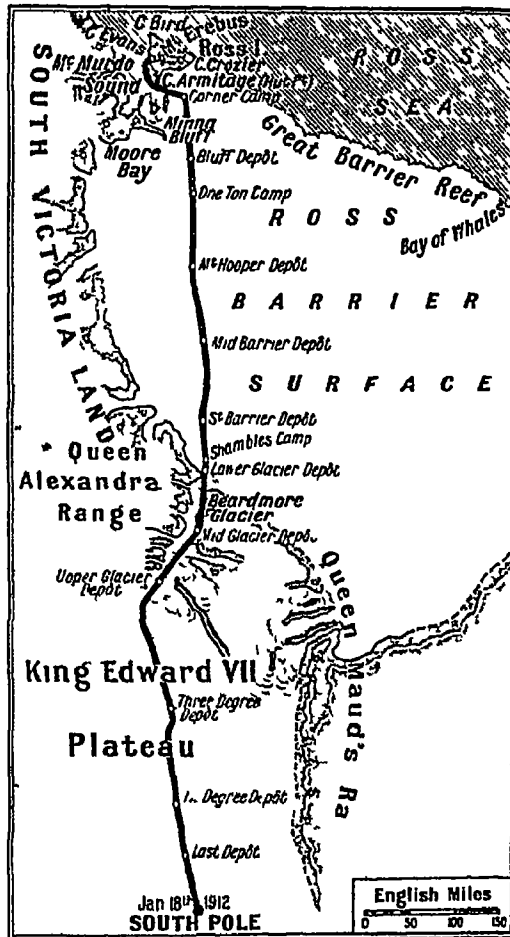
Scott's last expedition sailed from Port Lyttelton, New Zealand, on November 26, 1910, in the little Terra Nova, formerly a whaling ship, besides the human personnel of the expedition, she took ponies, sledge-dogs, motor-sledges, and a mass of other equipment of all sorts, to see the party through two years of South Polar weather. On the way towards the Antarctic she was battered by a terrible storm, but she eventually arrived at the edge of the Antarctic Continent. By the end of the year the base camp was built, and from there, during the first year, a way was gradually blazed across the Great Ice Barrier. One item of news gleaned during the first winter was of the presence of Amundsen, established on the edge of the Barrier. Throughout the

winter scientific work of all sorts was carried on at the base camp, for it must be emphasized that Captain Scott was no mere explorer, nor even a naval officer on a trip of exploration, he was a scientist of the first order, and it is for this reason that, although tragedy over-

whelmed him and his immediate companions, the work he did is of inestimable value to science. In no sense was his journey in vain. But Scott was no cold, unemotional scientist, but a human and lovable character to whom all his comrades were bound by affection, and it was largely due to him that this expedition, and above all this winter in the most terrible part of the whole world, was carried through with never a strain on the *esprit de corps* of the party.

At last, as the sun began to rise again above the grim polar horizon, preparations were made for the journey southwards, across the Barrier, and then on over the Polar Continent to the great goal, the South Pole itself. On November 1, 1911, the Polar party, consisting of Scott, Dr. Wilson, Capt. Oates, Lieut. Bowers, and Petty-Officer Evans, together

with supporting parties, set out. From the first troubles beset the parties. The motor-sledges proved unsuccessful, the snow surface of the Great Barrier made going appallingly difficult and slow, and blizzard after blizzard swept down upon the party. The ponies gave out one by one, were shot and fed to the sledge dogs, having just enabled their owners to cross the Barrier to the Beardmore Glacier, the edge of the mainland. Finally, on January 4, 1912,



ROUTE FOLLOWED BY SCOTT ON HIS LAST JOURNEY TO THE SOUTH POLE

SCOTT



CAPTAIN SCOTT, SCIENTIST AND EXPLORER, WRITES UP HIS DIARY

In this photograph, taken at the Cape Evans base camp of his last expedition, we see Captain Scott in a new light. For we are inclined to remember Scott as an explorer of the Antarctic, and to forget that he was also a first-class scientist, a fine organizer, and an important contributor to our knowledge of life in those southern wastes. Here he is making entries in his diary, notice the rows of books on the shelves of this hut, the collecting boxes, field-glasses, and cameras, which indicate the nature of his expedition's work. On the walls may be seen photographs of his wife and small son.

Photo H. O. Ponting British Antarctic Expedition 1910-13 Copyright Paul Popper



'A VERY GALLANT GENTLEMAN' WALKS OUT TO MEET DEATH

"I am just going outside and I may be some time," said Captain I. E. G. Oates. Both he and his comrades knew that he was walking to his death in the wild fury of the Antarctic blizzard which beset their tent. For days he had suffered terribly from frostbite, and the time, he knew, had come when his companions could do no more for him, and when he must disburden them of himself. Yet even his great sacrifice failed, in the end, to save the party from disaster.

From the painting by J. C. Dollman by permission of Messrs. Thea Forman & Sons, Nottingham.

the last supporting party was sent home, and alone in the wastes of the Antarctic were the five men of the polar party. Just twelve days later the party came across a cairn showing them that they had been forestalled by Amundsen's party, the next day they reached the Pole, finding the Norwegians' cairn. They left a cairn surmounted by the Union Jack, photographed themselves, and on January 18 started on their homeward way.

For days the wind and the weather had been against the heroic five, and now, when they might justly hope to have conditions in their favour, the wind was again their enemy. They suffered, too, from sickness, from lack of the right food, from snow-blindness and frostbite while there was none of the sun of success to warm their hearts. The first to die, after just a month of this terrible journey, was Evans, a victim to frostbite and suffering from concussion after a terrible fall. Another month later, and gallant Captain Lawrence Oates became disabled. He could go no farther, and it was death for his comrades to stay with him. So, without any good-bye, he calmly walked out of the tent into the blinding blizzard to meet his death.

Even this sacrifice was in vain. When the survivors at last knew that the end was near, Captain Scott wrote his imperishable farewell to England, in which he said: "I do not regret this journey, which has shown that Englishmen can endure hardships, help one another, and meet death with as great fortitude as ever in the past. We have been willing to give our lives for this enterprise, which is for the honour of our country."

And to his wife he wrote: "Make our boy interested in natural history if you can. It is better than games. Keep him in the open air. Above all, you must guard him from indolence. Make him a strenuous man. The great God has called me. Take comfort in that I die in peace with the world and myself, and am not afraid."

The last entry in Scott's tragic diary was dated March 29, 1912, but it was eight months before the tent was discovered, and within it Scott and his two companions lying as they had died. Where they lay a great cairn was erected, surmounted by a cross and a record of the little band of heroic men it covered and commemorated.

The PRINCE of ROMANCERS

The greatest historical novelist in English literature, and a writer of some of our finest narrative poems, Sir Walter Scott was not only one of the world's best story-tellers but a most lovable character

Scott, SIR WALTER (1771-1832) A bold hard-fighting clan were the Scotts of old, whose boast was that—

By the sword they won their land,
And by the sword they hold it still

What would "auld Watt of Harden" (Scott's ancestor) have said if he could have known that the greatest glory of his line would be the lame son of an Edinburgh lawyer?



Scott Monument, Edinburgh

"Auld Watt's" illustrious namesake was kin as well to many other historic Scottish families, and the "old tales" of Scottish history that he heard "by the winter's hearth" in childhood were often tales of his own forefathers. If an early illness, that we know today as infantile paralysis, had not left him lame from the age of 18 months, Walter Scott might have continued the traditions of his race in deeds, not words.

In spite of his lameness the boy, whose physical training was looked after by a wise uncle,

became a fearless rider and a "bonny fechter" (fighter), growing up tall, well-formed, and extraordinarily strong and active—"wayward, bold, and wild," as he himself wrote. In school he was a meteor, now at the bottom of the class and now at the top, already a lover of old things and old ways, a weaver of romances, noted for a capacious memory, which retained only what appealed to him and absolutely rejected what did not.

In his 15th year he was apprenticed to his father's profession of law, and practised it with out enthusiasm for a number of years. The publication in 1802 of the first two volumes of his "Minstrelsy of the Scottish Border," for which he had been collecting material ever since his early college days, unmistakably indicated his true vocation. The "Minstrelsy" showed the hand of the poet, the romancer, and the living antiquary; it was an immediate success.

Meanwhile Scott, at the suggestion of young Lady Dalkeith (afterward Duchess of Buccleuch), had undertaken a poem based on the legend of a goblin page. The Duke of Buccleuch was the head of the house of Scott, and thus, out of the poet's desire to do honour to his friend and feudal chief, grew "The Lay of the Last Minstrel," which, both in story and in setting, embodies so much family tradition.

SCOTT

The poem was published in 1805, and took the public by storm. The metre was new, the wild tales of the Scottish border had never before been used as literary material, the combination was magical. The sales of the book were, for the time, enormous.

Scott now resolved to make literature "his staff, not his crutch." His serious business became the editing of stately rows of works of other authors, but as a relaxation he began "Marmion," which was published in 1808 and became even more popular than "The Lay of the Last Minstrel." In 1810 appeared "The Lady of the Lake," which made Ellen's Isle and Loch Katrine fashionable sights for tourists.

Meanwhile, Scott's private affairs had reached a crisis, which was to have an effect on his literary life. In 1797 he had married Miss Charlotte Carpentier, the daughter of a refugee French royalist, and now had several children. In 1812 he purchased a small derelict estate on the Tweed, near Melrose, which he named Abbotsford (qv), and on the enlargement and improvement of which he optimistically spent his large earnings before they were at hand. In 1813 his publishers, the Ballantynes, whose partner Scott had become a few years before, were on the verge of bankruptcy, a calamity only narrowly averted. Two new poems ("Rokeby," 1813, and the "Lord of the Isles," 1815) were received with enthusiasm, but their sales showed a waning popularity, partly because Byron's "Childe Harold," which appeared in 1812, had secured a temporary monopoly of literary attention.

During this period of gathering cloud Scott, searching for some fishing tackle, came across a manuscript of his which contained the first chapters of a prose romance, begun and laid aside in 1805. He resolved to complete it. Thus "Waverley" came to be published in 1814—but anonymously. It not only surpassed the success of the poems, but wrought a literary revolution, bringing in the fashion of the historical romance. Then followed "The Antiquary," "Old Mortality," "Rob Roy," "The Heart of Midlothian," and others of the famous Waverley Novels, in rapid succession. Never did fortune seem to smile more kindly

on any man. Though Scott still published his novels anonymously, the authorship was an open secret. Wealth and honours were heaped upon him, in 1818 he was created a baronet. In addition to the two or three novels a year he kept pouring out, Scott was also publishing scores of essays and other works under his own name. Yet, the most hospitable of country squires, he seemed to be the idlest of men and entirely at the disposal of his swarms of guests. None but a few intimate friends knew how early he got up in the morning, or that he had a torturing internal disorder.



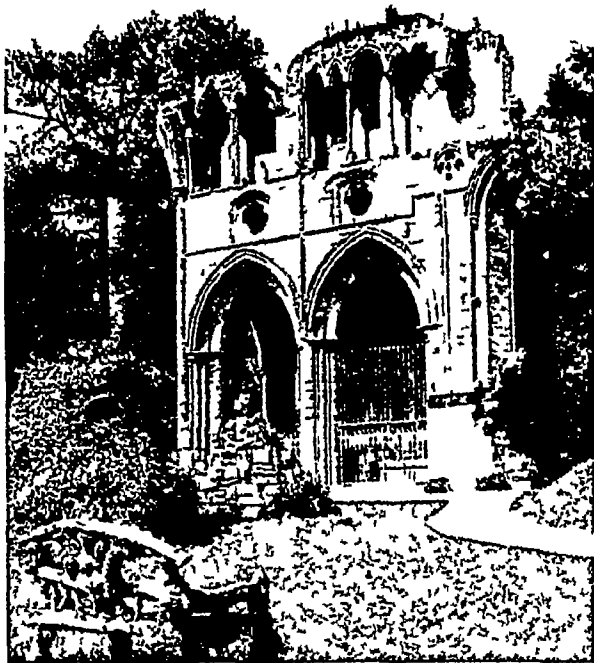
SCOTT IN HIS STUDY

National Portrait Gallery

This painting of Sir Walter Scott in his study is by Sir William Allan. With one of his favourite dogs at his feet, and surrounded by relics of past ages, Sir Walter is seen in the room at Abbotsford in which he wrote the stirring historical romances that have charmed thousands of readers.

In 1826 Scott's publisher failed, and Scott became responsible for £130,000 of debts. Against the dark days that followed the heroic elements in Scott's character stand out as they never could in prosperity. He refused to become a bankrupt—a step which would have permitted him to retain the use of his own earnings—but set furiously to work to pay his creditors in full. "I will be their vassal for life," he said, "and dig in the mine of my imagination to find diamonds to make good my engagements, not to enrich myself."

His wife died, he was stricken first with rheumatism and then with paralysis. Still he struggled bravely on to complete a task greater than he knew. His debts were in the end paid in full, but not until after his death, which was the direct result of his immense exertions.



Fred W. Hordie

SIR WALTER'S LAST RESTING-PLACE

Sir Walter Scott died at Abbotsford, his house on Tweedside, in 1832. He expired in the arms of his son-in-law and biographer Lockhart, who lies buried beside him in this lovely resting-place in Dryburgh Abbey. The abbey was presented to the nation by the late Lord Glenconner.

When his physicians recommended a sea voyage for his health a Government vessel was placed at his disposal. For almost a year he cruised about in the Mediterranean. But when he felt that his end was near, he insisted on being taken home to his beloved Abbotsford.

(qv), and there he died on September 21, 1832. He was buried in the ruined Dryburgh Abbey.

Scott set slight store by literary reputation (he did not publicly acknowledge the authorship of the novels until 1826), and perhaps it meant more to him that he left the stainless name of a chivalrous and kindly gentleman than that he was known as the prince of romancers.

Scott may be called the creator of the historical novel, and in this field he has not been surpassed. His influence on European literature was enormous, and he is generally regarded as a pioneer of the Romantic Movement. Not always strictly accurate, he has that magic power of making the characters and events of the past vividly and thrillingly alive.

Among Scott's principal works are the long narrative poems "The Lay of the Last Minstrel" (1805), "Marmion" (1808), and "The Lady of the Lake" (1810), and his novels "Waverley" (1814), "Guy Mannering" (1815), "The Antiquary" (1816), "Old Mortality" (1817), "Rob Roy" (1818), "The Heart of Midlothian" (1818), "The Bride of Lammermoor" (1819), "Ivanhoe" (1820), "The Monastery" (1820), "The Abbot" (1820), "Kenilworth" (1821), "The Fortunes of Nigel" (1822), "Peveril of the Peak" (1822), "Quentin Durward" (1823), "Redgauntlet" (1824), "The Talisman" (1825), "Woodstock" (1826), "The Fair Maid of Perth" (1828), "Anne of Geierstein" (1829), and "Tales of a Grandfather" (1828), a history of Scotland. The Life of Scott, by his son-in-law, J. G. Lockhart, is one of the best biographies in the English language.

The Tournament of Ashby

A SEA of waving plumes and shining helmets, forests of tall gleaming lances, clusters of pavilions magnificent with their scarlet, green, and gold, long tapestried galleries thronged with gaily decked nobles, knights, and ladies, together with an eager crowd of common folk—this was the view that met the gaze of treacherous Prince John of England as he rode into the great field at Ashby and took his place in the royal gallery, some 700 years ago. It was the day of the great tournament, when the most gallant and skilful knights of all the land were to contend with lance and sword for fame and the honour of their fair ladies.

At a signal from the prince the heralds proclaimed the laws of the tournament. Five renowned knights were challengers against all comers, to combat such knights as touched with their lances the challengers' shields, which hung before their pavilions. When a shield was touched with the point of a lance, the deadly combat with sharp weapons was to follow,

when touched with a reversed lance, the safer "arms of courtesy"—lances tipped with a flat round board—were to be used. When each of the knights had broken five lances the prince was to select the first day's victor, who was to win not only a fine war horse, but the right to choose some fair maiden to be Queen of Love and Beauty and sit on a throne opposite to Prince John and award the next day's prize.

"Largesse!" cried the heralds, and amid a shower of gold and silver pieces they added, "Love of ladies—Death of champions—Honour to the generous—Glory to the brave!" Five knights advanced from the northern enclosure towards the tents of the challengers at the south. Martial music gave them a defiant welcome as each touched with a reversed lance his antagonist's shield, and retreated to the extremity of the field. Then, as the challengers, headed by the renowned Brian de Bois-Guilbert, appeared in the lists, there was a flourish of trumpets. At full gallop the knights charged against one

another. Shouts, cries, and clanging trumpets told a few moments later of the challengers' triumph and of the defeat of four of their opponents. Again and again various other parties of knights met a similar defeat from the triumphant five, who, strong and dextrous, never lost their seats, never swerved from their course. Brian de Bois Guilbert, who with a single spear had overthrown two knights and foiled a third, now seemed to be the winner.

All at once a solitary trumpet sounded in the distance, and a stalwart graceful figure appeared, with helmet visor down, mounted on a gallant black charger and bearing the Spanish word *Desdichado* ("Disinherited") on his shield. Straight to the pavilion of Brian de Bois Guilbert he went, and rapped the shield smartly with the sharp end of his spear.

A trumpet signal, a dash, and the champions met with a thunderous shock, their horses recoiling, their lances shivering into splinters.

Shouts from excited spectators, a great waving of scarfs, a retreat for fresh lances, a moment's hush, and then another violent onset. This time the Disinherited reeled from the other's blow but remained on his steed, while his enemy, hit fair by the lance's point in the bars of his helmet, reeled also, then—as his saddle-girths gave way—rolled to the ground, vanquished! One by one the unknown knight then encountered the four other challengers, and one by one triumphed over them.

As he advanced on foot to receive the splendid war horse which was the victor's prize, the Disinherited Knight refused to raise his visor and show his face. "Can it be Richard Coeur de Lion himself, escaped from Austria?" whispered a courtier to the prince, who blanched at the thought of his brother's return, and of the usurped power he must give up.

The Unknown Knight accepted his prize with

a bow and vaulted into the saddle without touching the stirrup. Then with a coronet of green satin hooped with gold upon his lance's point he paraded slowly around the lists, scanning the flushed and smiling faces of the fair ladies while the spectators in breathless silence awaited his choice for Queen of Love and Beauty. He paused at length beneath the balcony of Lady Rowena, a fair Saxon maiden who with far off eyes was thinking of her vanished lover Ivanhoe, disinherited by his stern old father for friendship with the Norman conquerors, and who had accompanied Richard the Lion Heart to Palestine. Slowly the day's



DE BOIS-GUILBERT OVERTHROWN

Brian de Bois Guilbert has been unhorsed by a mighty lance-thrust of the Disinherited Knight. Stung with madness at this disgrace, he draws his sword and waves it in defiance of his conqueror. But the marshals of the field intervene, for the laws of the tournament do not permit him to continue the combat on foot.

By courtesy of Geo. Harrop & Sons

champion lowered his lance and laid the crown before her, Rowena, his chosen Queen!

The general tournament was held on the following day. Fifty knights on each side, the one party under the leadership of Brian de Bois-Guilbert, the other under the Disinherited Knight, took part in the combat, using sharp swords and pointed lances.

What a fine sight the knights made as they arrayed themselves in lines opposite one another! Their plumes fluttered in the morning breeze, their steeds pawed the ground and their hundred lances glistened in the sun. Then, "*Laissez aller!*" ("Let them go!") shouted the marshal.

The Black Knight to the Rescue

As the leaders met, their eyes flashed with the hatred of rivalry, and a furious fight began. Suddenly two other strong knights bore down upon Bois-Guilbert's opponent. "Beware, Sir Disinherited!" cried out the spectators, and the treacherously attacked knight reined back his steed in the nick of time. For the next few moments, like a great swooping hawk, he kept all three of his enemies at his sword's point. He would have been overpowered, however, had not help come from an unexpected quarter. A powerful knight in black armour, who had done no active fighting, now dashed to his rescue and with mighty clanging blows felled two of the assailants. Then the Black Knight galloped back, leaving the Disinherited Knight alone with Bois-Guilbert, the leader of the

opposing party, whom he quickly charged and struck to the ground.

At this moment the prince's truncheon fell, and the conflict was over. The Disinherited Knight, who had also overcome with his own hands six champions, in addition to Bois Guilbert, was reluctantly named victor of the day by unworthy Prince John.

Amid thunderous applause the hero was escorted by the marshals to the throne of honour where beautiful Lady Rowena was waiting with the chaplet of victory. Despite his protests the marshals removed his helmet. At Rowena's feet knelt a handsome fair-haired young man of 25. The lady started back with a faint shriek. Then with enforced calm she placed the chaplet on the victor's head and said clearly, "I bestow on thee, Sir Knight, this meed of valour. Upon brow more worthy could wreath of chivalry never be placed!"

These last words were uttered with deep feeling, and no wonder! For the Disinherited Knight, stooping to kiss her hand, was none other than her long-lost lover—Ivanhoe.

Not until later did England learn that Ivanhoe's Black Champion, who had come so bravely to his rescue, was King Richard the Lion Heart himself, secretly returned to England to reclaim his throne from the treacherous brother to whose plots he owed his long detention in captivity while returning from the Holy Land.—*Retold from Scott's "Ivanhoe"*

CLAY & MARBLE SHAPED to BEAUTY

The miracle of the sculptor's art is "to take a block of marble and convert it wholly into thought." In the history of this art we find the expression of Man's noblest thoughts and aspirations.

Sculpture. Sculpture (the word is derived from the Latin *sculpere*, meaning "to cut" or "to carve out") is the art of representing the



The Sculptor at Work

form of an object by cutting, carving, or otherwise shaping a solid substance, such as stone or marble, clay, wood, ivory, or bronze. It is often called "the plastic art," from the Greek word meaning to model or shape.

Some figures are so made that they may be seen entire, or from all sides. Such works are technically called sculptures "in the round." When the figures are attached to a background, they are said to be "in relief"—"high relief" if they project far from the background, and

bas-relief, or "low relief," if they project only a little. Sometimes the design, instead of being raised, is hollowed out below the surface. This is known as *intaglio*, and is used mainly in the carving of precious stones for jewelry.

In making a statue the sculptor, just like the painter, must start with a number of sketches and drawings, often done with the utmost accuracy on squared paper. Next, he prepares a small model or sketch of wax or clay, to try the general effect. Then he makes a full-size figure of clay, using a sort of skeleton or framework of iron if the figure be a large one, and modelling the damp clay with his fingers or with simple tools of wood, bone, or iron. When this is finished, it is covered with a mixture of plaster of Paris and water, which quickly sets and, when removed, makes a hollow mould. The inside is brushed with some oily substance to prevent sticking, fresh plaster is poured in, and, when it has set, the mould is removed and a true cast appears.

SCULPTURE

If the statue is to be of marble, this cast is copied exactly by a skilled workman, with the aid of a pointing machine, which measures off points on the block of marble corresponding to those on the model and thus indicates exactly where the workman is to cut. The artist himself usually puts the finishing touches upon the marble statue, although in some cases he does not touch the marble at all.

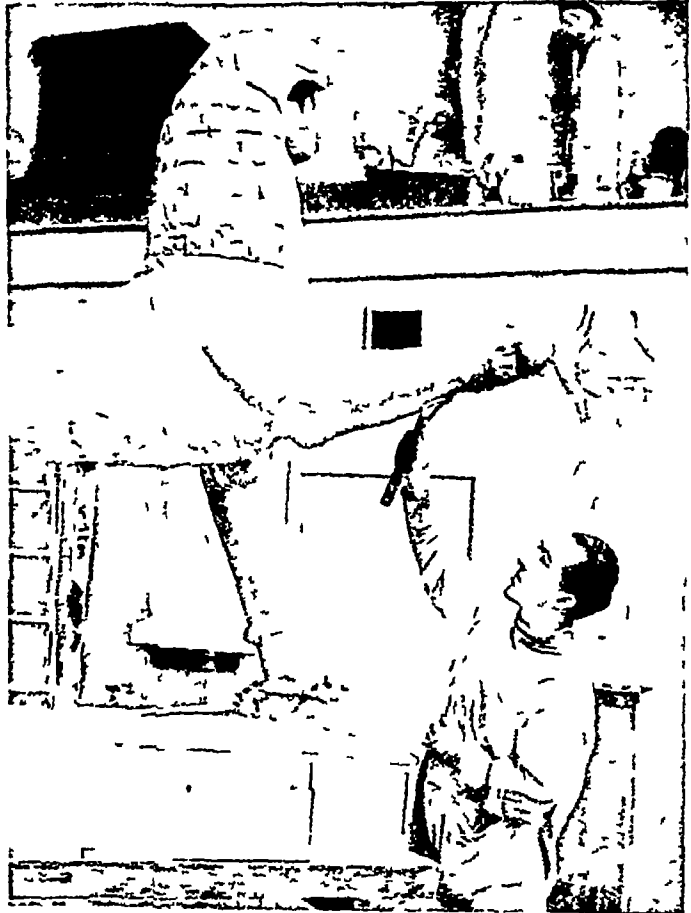
Such is the method commonly used by the sculptors of today. Formerly, before mechanical devices were so perfected, the sculptor left less to his assistants. Michelangelo is one of the few sculptors who are known to have carved statues directly from the block of marble, sometimes he did not even make a small model to work from—such was his marvellous skill in hewing his great conceptions into form. Bronze statues are made by pouring melted bronze instead of plaster into the mould, a process that is attended with the greatest difficulty and requiring great care.

We have no record of the beginning of sculpture. Perhaps the same instinct which leads children to shape sand or clay into forms imitative of natural objects led primitive Man to fashion his first crude works of sculpture. But it is not until some deeper spirit enters into it that sculpture becomes a fine art.

That spirit, we have reason to believe, was the first of all religions—the same spirit which in its earliest form led men to set up idols of wood or stone and worship them, and which in a higher form inspired the marvellous sculpture of the Greeks and, to a certain extent, the great works of the Italian Renaissance.

In Egypt, where we find remains of art over 7,000 years old, it was the belief in the immortality of the soul that chiefly inspired the sculptor. The preservation of the *ka* or spirit, it was believed, depended upon the preservation of the human body as a mummy, or, failing that, of its representation in a sculptured portrait. Regarding the tomb as Man's age long dwelling-place, they also gave much care to sculpturing reliefs upon its walls.

Durability was the chief quality sought and attained by the Egyptians. In making statues of their Pharaohs, they chose the hardest materials—basalt, diorite, and granite. And thanks to the dry air of Egypt and the practically hermetic sealing of the tombs, not only these but works in softer materials, such as sandstone, limestone, and even wood, have



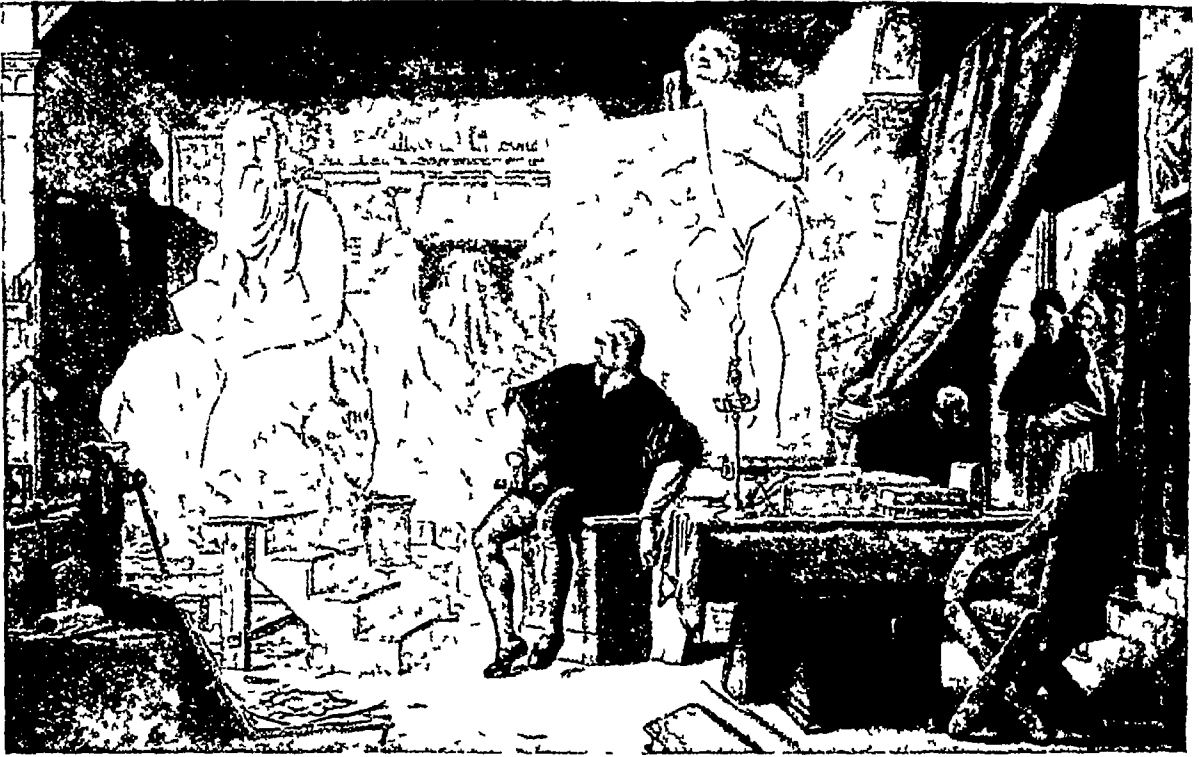
IN A MODERN SCULPTOR'S STUDIO

After the sculptor has conceived his design, he carries it out in clay as a full-size model. This is the stage seen in this photograph of Mr. A. F. Hardiman, the English sculptor, at work in his studio on one of the lions he designed for a new Town Hall at Norwich.

withstood the elements for thousands of years. Many other statues of times as early may be seen in museums in Egypt and elsewhere.

Although the faces are realistic portraits, these statues—especially after Egyptian art was conventionalized—appear stiff and lifeless to us. They all face squarely to the front and a vertical line could be drawn through the nose, the centre of the breast-bone, and down to the ground.

The art of the Babylonians is almost as old as that of the Egyptians. They were especially fond of representing great muscular strength. The Assyrians and Chaldeans continued these traditions, and also showed great skill in depicting animals, such as the wonderfully life-like wounded lion and lioness now preserved in the British Museum. They are famous, too, for the great winged Man-headed bulls which they set to guard the entrances of their palaces. Notable, too, are the exquisite figures carved in ivory by the ancient inhabitants of Crete, the wonderful attainments of whom have only



SEATED AMONG THE IMMORTAL CHILDREN OF HIS DREAMS

Sitting in his studio, surrounded by many of his famous works, Michelangelo regards with the deeply critical eye of a master the result of his untiring labours on the fine statue of Moses (see page 2295), designed for the tomb of Pope Julius II. Lost in thought, the great man does not heed the entrance of one of his rich patrons through the curtained doorway.

From the painting by Alexandre Cabanel

recently been revealed to us (See Aegean Civilization). From very early times, too, fine sculpture was produced in the East.

The Greeks learned much from the older peoples of the Mediterranean, but their early ("archaic") sculptures were extremely crude. Gradually they developed a perfection in sculpture such as had never been seen before. The story of their art and of that of the Romans who followed them is told elsewhere (See Greek Art, Roman Art).

During the Middle Ages the beautiful Christian churches were made still more exquisite by a multitude of carvings and reliefs and statues. Such sculpture was employed chiefly as an adjunct to architecture, and was largely subservient to its requirements, especially during the Romanesque period. But the great flowering of Gothic art in Northern Europe saw some real masterpieces, and, in the carving of draperies especially, the Gothic mason-artists have, perhaps, never been surpassed.

Yet sculpture as an independent art did not come into its own again until the Renaissance (*q v*). For inspiration the sculptors of this brilliant period turned to the models of the ancient Greeks and Romans as well as to the world of Nature.

Ghiberti (1378-1455), who wrought the beautiful bronze doors for the baptistery at Florence (see page 1859), may be considered the first of the great sculptors of the Renaissance. Donatello (1386-1466) won distinction by his

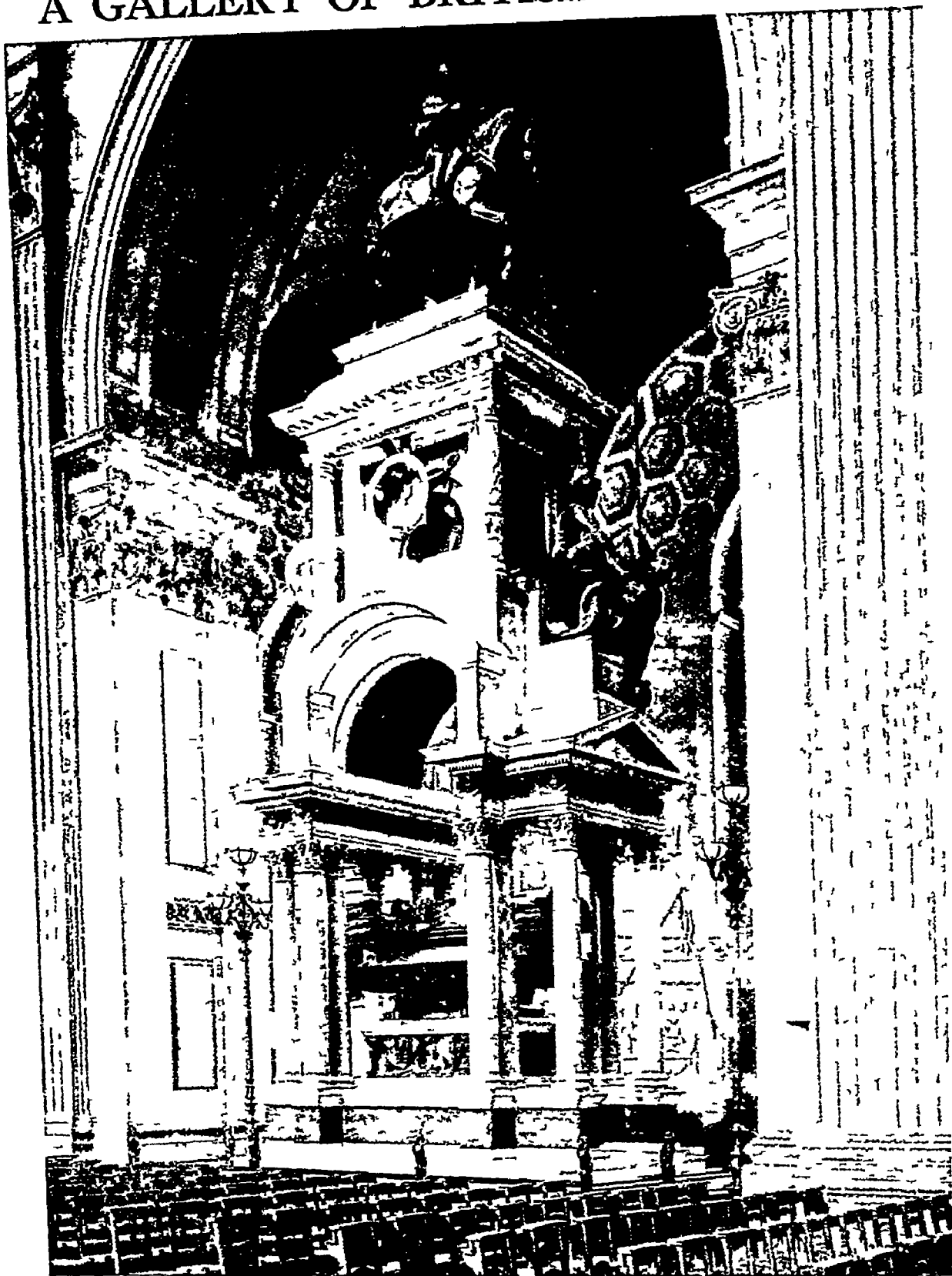
vigour and truth to Nature, by portraying the charm and grace of childhood, as well as for one of the finest equestrian statues of all time, the bronze monument of Gattamelata, a noted military leader in Padua. One of his pupils, however, Verrocchio (1435-1488), made an even more beautiful equestrian statue, that of Colleoni, in Venice, generally considered the greatest equestrian statue in the world (See p 2296).

Luca Della Robbia (1399-1482) and his nephew, Andrea Della Robbia (1435-1525), produced some of the most delightful works in the whole realm of sculpture, especially in their figures of children. Luca perfected the process of enamelling terra-cotta, which came to be known as Della Robbia ware. Andrea modelled the charming little white babies on blue backgrounds ("bambinos") which decorate the founding hospital at Florence, of which countless copies have been made (See p 3459).

With the great figure of Michelangelo, in the 16th century, Renaissance sculpture reached its highest point. He "stood on the shoulders of Donatello and Verrocchio, and added to their supreme science the passion, frenzy, and explosive power of his own volcanic nature."

The Florentine Benvenuto Cellini (1500-1571) was distinguished first for his exquisite work as a goldsmith (see page 1741), but later for his beautiful statue of Perseus and other works in bronze, and Giovanni da Bologna (c 1530-1608) won fame for his graceful "Flying Mercury."

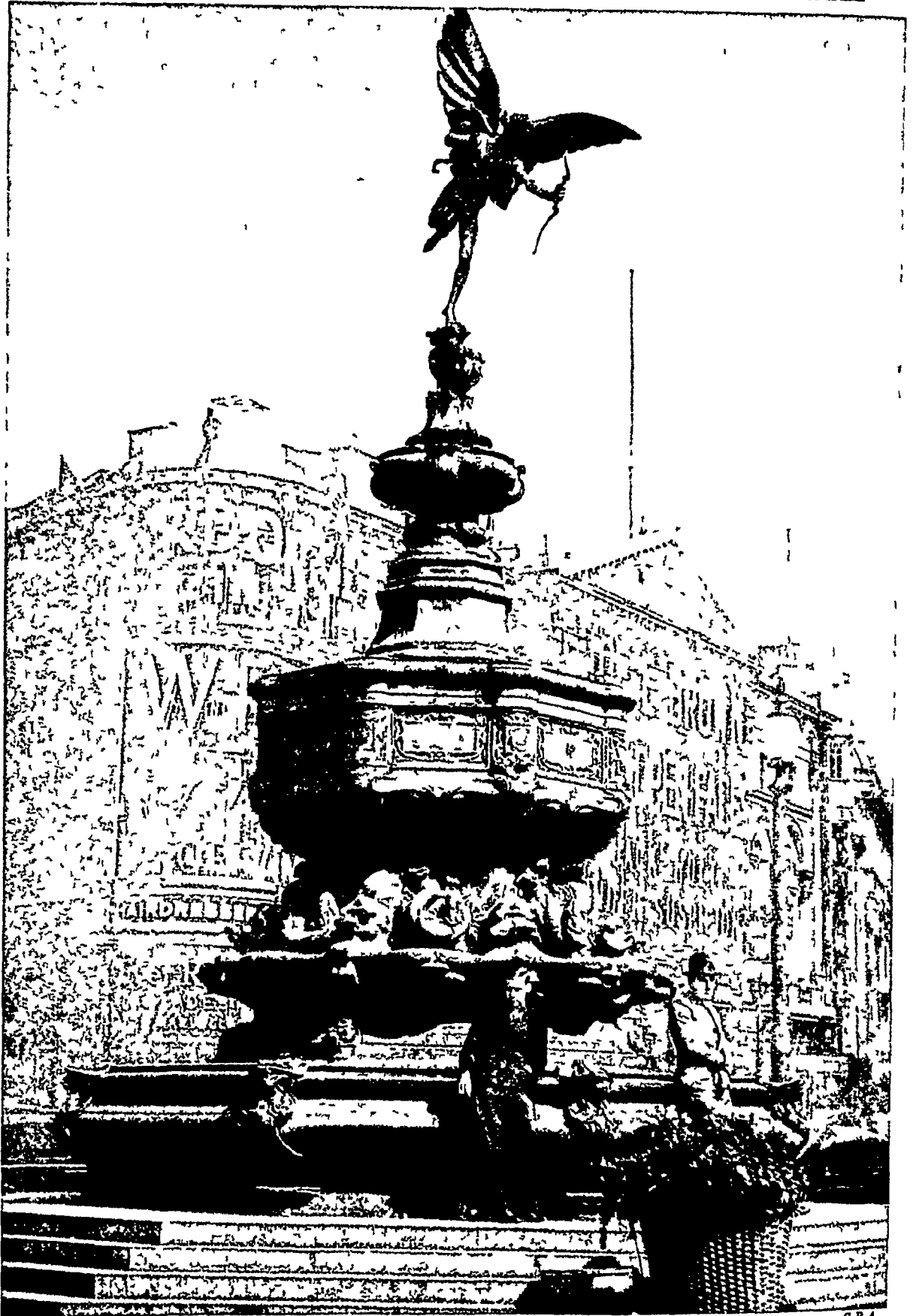
A GALLERY OF BRITISH SCULPTURE



Arthur Wellesley, first Duke of Wellington, the great English soldier, was buried in St. Paul's Cathedral on November 18, 1852, but it was not until many years after his death that the monument to him seen above was erected. The tomb consists of a great block of porphyry resting on a granite base. The memorial was designed by Alfred Stevens, but was unfinished at the artist's death in 1875 the bronze equestrian statue being placed in position in 1912.

A. F. Kerating

FAMILIAR LANDMARK OF LONDON'S CENTRE



Few pieces of statuary are better known to Englishmen, and to Londoners in particular, than Sir Alfred Gilbert's graceful figure of Eros, the God of Love, which crowns the Shaftesbury Memorial fountain in Piccadilly Circus. From its vantage-point above the hub of London's night life it has looked down on many a packed throng on Boat Race nights and New Year's Eves, and when it was temporarily removed to the Embankment Gardens during the building of a new tube station under the Circus, Londoners felt a curious sense of loss while the old familiar landmark was in exile

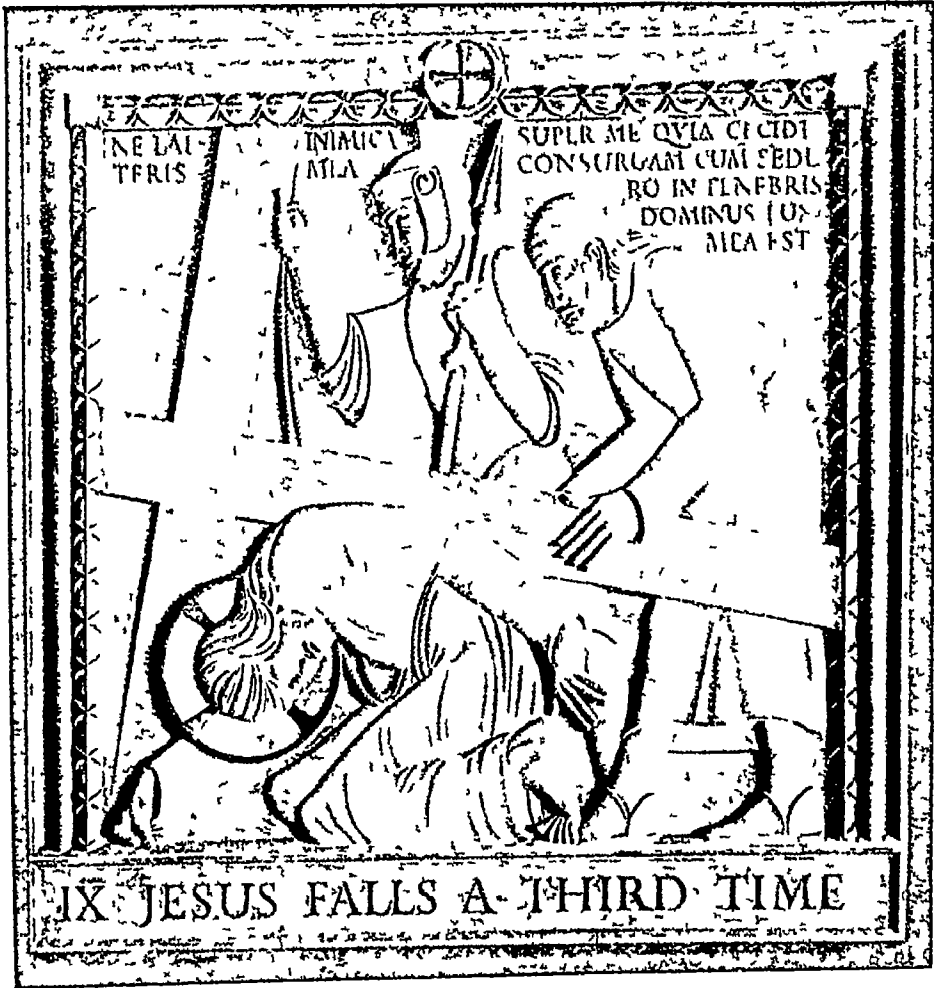
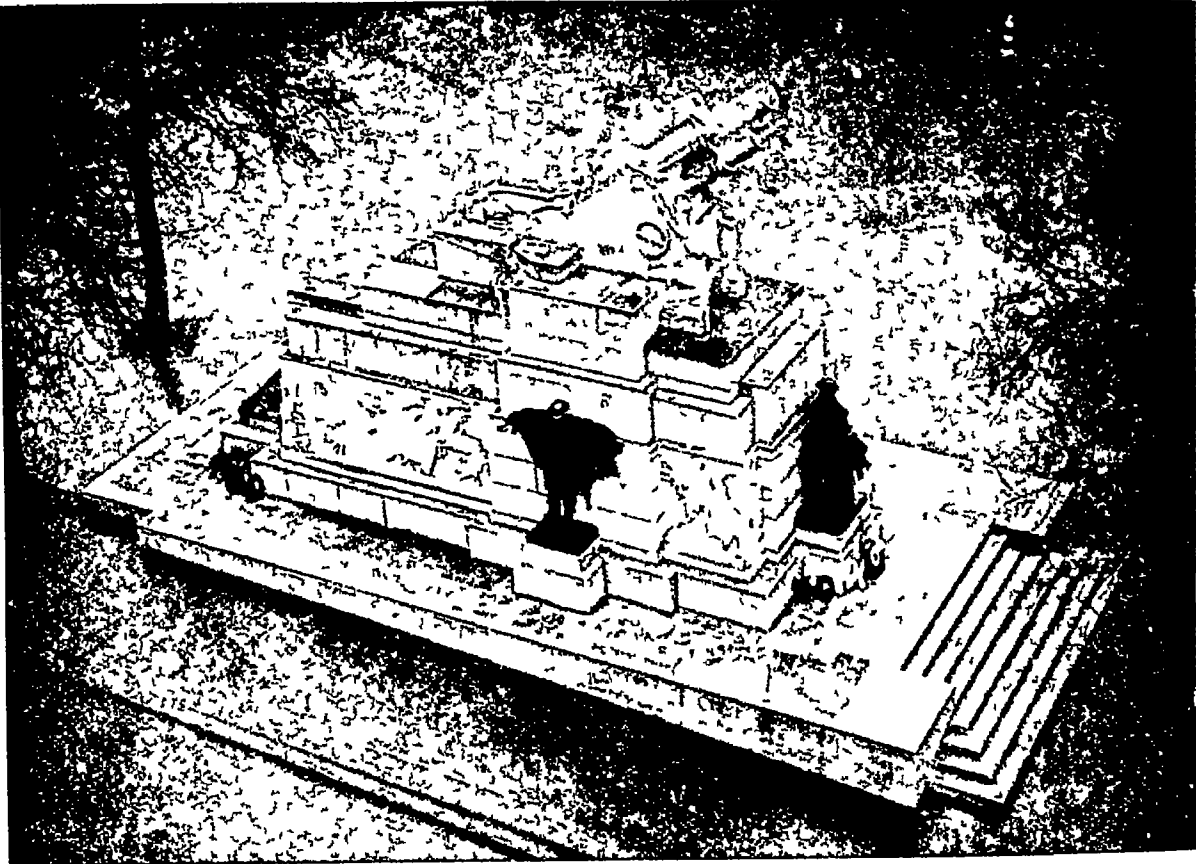
SPIRIT OF YOUTH IN A FAMOUS LONDON PARK



Fox Photos

Youthful visitors to Kensington Gardens lose no time in seeking out Sir George Frampton's delightful statue of Peter Pan, which stands just near the Serpentine, for "the boy who would never grow up" will remain a favourite hero of young folk for many years to come. Sir George Frampton, who died in 1928, was for long one of the leading figures in the English art world. He also designed the Nurse Cavell memorial in London, and was a great experimenter in decorative sculpture, using all kinds of material. The stone lions outside the British Museum are another example of his work.

IMPRESSIVE WORK OF MODERN BRITISH SCULPTORS



Above is the Royal Artillery memorial, which stands at Hyde Park Corner, London. Designed by the late Charles Sargeant Jagger, it is most impressive in its stern simplicity. The bas-reliefs depict typical scenes in a gunner's life during the World War of 1914-1918, while on each side are life-sized bronze figures of steel helmeted gunners.

Eric Gill's fine line, his clear, bold cutting, and his gaunt simplicity link him with the best period of Gothic art. This formal carving, one of the series of Stations of the Cross, was made for Westminster Roman Catholic Cathedral. It represents Our Lord stumbling beneath the heavy Cross on the road to Calvary.

Photos top Fox Photos
bottom Medici Society Ltd

SCULPTURE

But, more and more, sculpture was falling into artificial mannerism, becoming very elaborate, delicate, and fanciful, with neither the simplicity of the Greeks nor the power of Michelangelo.

The result was the *baroque* style, ornamental but in many ways debased, which spread over most of Europe. From this there came a reaction in the 18th century and an attempt to return to the simplicity of classic art. This movement was begun by Canova (1757-1822). His statues of figures from Greek mythology were remarkable for their perfection of form and delicate and careful execution. Though not a genius of the highest rank, he restored sculpture to the place which it had lost.

Amongst those who helped to carry on this movement was the Danish sculptor, Thorwaldsen (1770-1844), who came to Rome in 1797. He is most famous for his life-like "Lion of Lucerne" carved in the natural sandstone of the Alps. Thorwaldsen, as a teacher, had tremendous influence, but after a time it became apparent that his work, like that of Canova, and that of John Flaxman (1755-1826), who represented the classic manner in England, lacked vitality.

One of the first to turn from the imitation of classic models and to infuse new life and feeling into his work was the French sculptor Houdon (1740-1828), whose portraits of Voltaire, Rousseau, Napoleon, Molière, and Mirabeau make these historic figures real for all time. Another Frenchman, A. L. Barye (1796-1875), represented the life and movement of animals as sculpture had never done before.

Other French sculptors of the 19th century—Rude, who made the inspiring group of figures in high relief on the Arc de Triomphe in Paris, called "The Departure", Bartholdi, to whom America owes the colossal statue of Liberty in New York harbour, Chapu, known by his beautiful "Joan of Arc", Frémiet, Dubois, and Barrias—show much of the classic spirit combined with a strong individuality.

Alfred Stevens as a Sculptor

But greater than these, and greatest of all English sculptors, was Alfred Stevens (1818-1875), who re-discovered a great deal of the true Renaissance spirit. He designed everything from fire irons and the lions on the British Museum railings, to the superb monument to the Duke of Wellington in St Paul's. His works as a painter you will find discussed in page 1502. After Stevens came one of the outstanding figures in the history of this art, namely the Frenchman Rodin. (See illustrations in page 3501). The greatest sculptor since Michelangelo, he represented the stern and rugged realities of life.

One really great sculptor in England was Sir Alfred Gilbert (born 1854), who did the



Dorcas Leigh

BY A YUGOSLAV SCULPTOR

Ivan Mestrovic is one of the outstanding figures of contemporary art. His skill in direct stone carving is at once apparent in his reliefs, one of which, "The Annunciation," is reproduced above. All his work is marked by boldness of execution and forcefulness of design.

"Eros" fountain in Piccadilly Circus as well as many other fine memorial sculptures.

Other modern English sculptors in the academic tradition include Sir William Hamo Thornycroft, Sir George Frampton—who did the "Peter Pan" in Kensington Gardens—Alfred Drury and Charles Jagger—famous for his war memorials. Important in England, too, are Jacob Epstein, Eric Gill, Henry Moore, and their followers.

Epstein (qv), at his best as a modeller of portrait busts, did some remarkable architectural work, but in this field Eric Gill was best-known, especially for his work on Broadcasting House, in London. Henry Moore, with several other younger sculptors, led an "advanced" group whose work was equivalent largely to that of the advanced painters (See English Art). One sculptor who also stood out, especially for his wood carvings of birds and animals, was Maurice Lambert.

Sea-anemone. Often in shallow sea-water you will see, attached to piles or rocks, groups of queer little creatures with petal-like tentacles waving languidly in the current, which could almost be taken for copies of brilliantly

SEA-ANEMONE

coloured garden asters. These are sea-anemones, a kind of polyp, found in all seas, but especially plentiful in temperate zones.

Sea-anemones vary in size from a quarter of an inch across the extended flower face to more than a foot in diameter, only a few, however, are really large. Their bodies are short hollow cylinders of soft flesh with a spreading base. At the free end is the mouth, about which are one or more circles of tentacles. In the outer skin of the tentacles are thousands of minute stinging threads, all curled up into tiny balls, ready for use. When a small fish or other animal comes swimming along, the sea-anemone shoots out from these "lasso cells" its barbed threads, which contain a poison that paralyses or kills its prey. Both the mouth and the body cavity can be extended, and the sea-anemone often devours an animal nearly as large as itself. Some very remarkable anemones live



AN UNUSUAL ANEMONE

This sea-anemone spends its life attached to the claws of a crab. It is not a true parasite, for the crab does not appear to suffer from the attentions of the anemone, but freely provides it with scraps of food which it does not want itself.

on the backs of the shells inhabited by hermit crabs, feeding on the scraps left over by their "hosts" (See illustration, page 1165).

Anemones multiply sometimes by budding or by division, but usually by eggs. The young swim in the water for a while until they find a spot on which to settle and grow. Along with most corals, sea-fans, and sea-feathers, the sea-anemone belongs to the class of *Anihozoa* ("flower-animals") (See Corals, Marine Life).

Sea-cucumber. If a Chinese cook says he will have "cucumbers" for dinner, don't be too sure that you know what he means. He may be planning one of his favourite native dishes made of "sea-cucumbers." Though it

SEA-HORSE



F. Martin Duncan

STRANGE SEA-CUCUMBER

One of the most curious of all sea creatures is the sea-cucumber, or holothurian. In shape, and in the prickly texture of its skin, it reminds us of a small ridge cucumber, though it is really animal, not vegetable.

does live in the sea, this creature has only a very superficial resemblance to a cucumber, for it is an animal, not a plant. Scientists call it a "holothurian," a term applied to a low class of marine animals, whose bodies are covered with warts or spines, and which generally do resemble a cucumber in shape. At one end of the body is the mouth, surrounded by small sensitive tentacles with which the food is gathered. Under the name of trepang, or *bêche-de-mer*, these creatures are considered a great luxury among the Chinese, Malays, and other peoples of the East and the South Seas. Their collection and preparation for the market is a flourishing industry among the islands of the Pacific. Sea-cucumbers, which grow from 10 to 15 inches long, are gathered from coral reefs, and are boiled, dried in the sun, and then over a fire, which gives them a smoky taste.

Sea-horse. With a head shaped like that of a tiny horse and a tail like a snake's, there is little about the sea-horse, *Hippocampus antiquorum*, to suggest that it is really a fish. At times it swims upright through the water with the aid of its strange little fins, but usually it remains at rest with its tail curled round a bit of seaweed.

The male carries the eggs about in a sort of pouch like a kangaroo's, until they are hatched. And until they are old enough to look after themselves the young take refuge in the paternal pouch when alarmed.

Sea-horses are found in warm seas. They belong to the pipe-fish family, *Syngnathidae*. Their swimming powers are feeble. Clothed in bony plates and spines, and closely resembling in colour the weeds among which they dwell, they are able, despite their helplessness, to escape their many enemies.

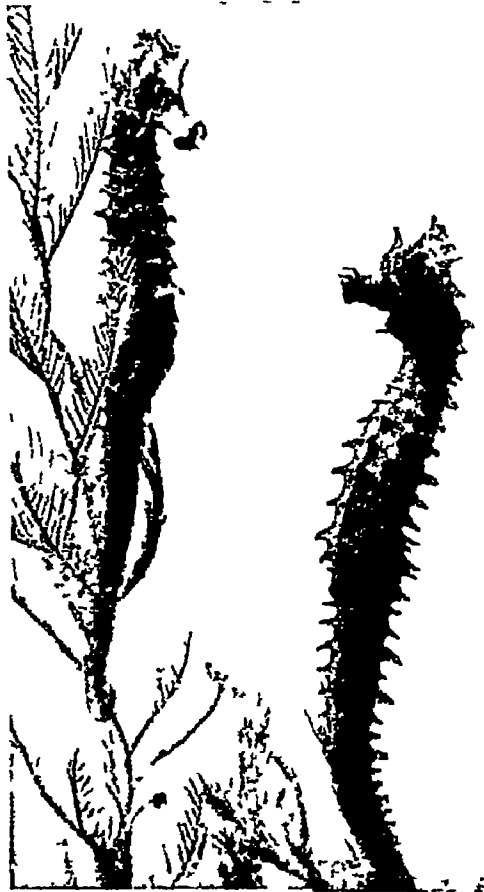
A near relative of the sea-horse, called the sea-dragon, is found in Australian waters. It is covered with countless flaps and appendages

SEA-HORSE

which give it the exact appearance of seaweeds. This curious fish, like all the members of the group, has a slender snout, through which it sucks up small sea creatures and the eggs of other fishes.

There are some 40 species of sea horses, ranging in size from two inches to two feet long. In the aquarium of the London Zoo are special tanks for these strange creatures.

Seal. At first you might think that these creatures were related to the whales, but, as a matter of fact, all seals are mammals of the *carnivore group*, and their nearest relatives are the cats, bears, and their allies. They produce one or occasionally two young annually, and these are at first covered with a coat of thick, soft, nearly white fur, which in some species is retained for two weeks or more. The young do not take to the water until this fur is shed, when they are taught by the mother to swim. There are two main groups of these creatures. True seals



TWO SEA HORSES

Sea-horses are amongst the strangest of all forms of marine life, and it is surprising to hear that they are really fish! These are examples of a species in which the fins are reduced to a minimum, but in some they are like delicate fern-fronds.

(which belong to the family *Phocidae*) do not possess external ears, and their hind limbs, or flippers, are stretched backward and closely united together. Walking on land is accomplished by a wriggling or shuffling action of the body, at times assisted by the fore limbs. The fur seals and their relatives (family *Otaridae*) have external ears and can walk and run on all four feet, and thus are nearer to the land animal type from which they developed.

The common seal is the most widely distributed and best known species. It ranges along the European shores of the Atlantic and Arctic Oceans, the shores of North America, and south in the North Pacific to the coast of Japan. Its usual haunts are the rocky points of the mainland coast and islands, and small herds collect on islets during the breeding season.

The common seal (*Phoca vitulina*), like other species, shows little fear of Man.



THE GREY SEAL SUNS ITSELF ON THE ROCKS

One of the species most frequently seen off the coasts of Britain, the grey seal is a typical representative of its group. Notice in this fine specimen, sunning itself on the rocks of the Scilly Isles, the dog-like head and pose, and the way in which all four limbs have been adapted to the seal's life in the water—although it still has claws, which shows that it is a mammal, not a fish.

Fox Photos

SEAL

unless hunted, when it becomes shy and wary. This seal is yellowish grey with dark spots, and attains a length of five or six feet. It is found off the East Anglian shores, but is actually less common with us than the grey seal, *Halichoerus grypus*, which is often seen off the more rocky western coasts. This is a larger creature, sometimes 8 feet long, and a mottled yellow grey.

Originally there were enormous numbers of some species, especially the Greenland seal, and the value of their skins and blubber made them

changes into the soft brownish fur. Their skins are so much prized for women's wraps and coats that some of the species are more or less extinct. The remaining herds now inhabit the North Pacific, where the number killed for the fur trade is strictly controlled by international agreement.

The sea-lions are eared seals, like the fur seals, and are the largest of the group, but their hairy coats have no value as fur. The northern sea-lion, which frequents the shores of the North Pacific, is the best-known. It is a big creature, sometimes attaining a length of 12 feet and weighing over 1,800 lb. In former days the natives of the Pribilof Islands made rain-coats out of the lining of the great sea-lion's intestines, and constructed boats by stretching sea-lions' skins over wooden frames.

The California sea-lion is a much smaller animal, only seven or eight feet long. Because of its intelligence this sea-lion is captured and trained for menagerie purposes, and all these creatures are extremely popular with visitors to zoological gardens.

But the monster of the seal family is the sea elephant or elephant seal, which, unlike the sea-lions, is classed with the true seals because

the basis of a great industry. Hundreds of vessels were sent out from European and American ports, and nearly a million seals were killed during each breeding season. This terrible slaughter has so reduced their numbers that now little sealing is done.

The fur seals or sea-bears resemble the true seals in habits and general appearance. Their limbs are longer and of more practical use on land, and for a distance of 100 feet they can run faster than a man can walk.

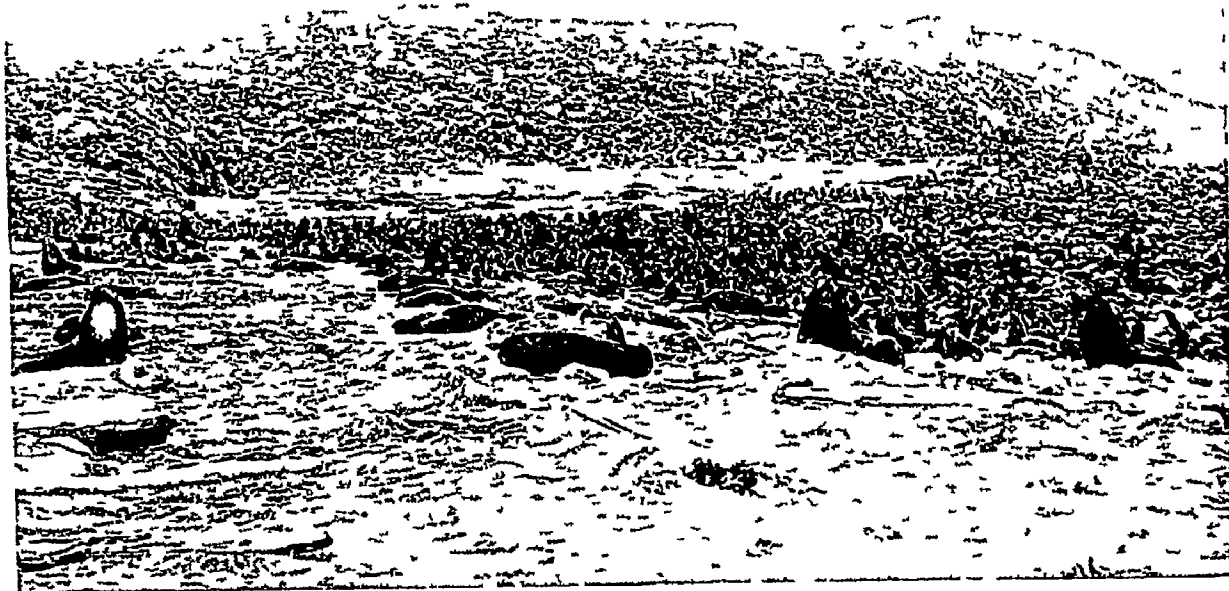
The young fur seals at first possess a jet-black coat, which later



THE TWO LARGEST MEMBERS OF THE SEAL GROUP

The sea-lion is the finest of all the seals, being indeed a most handsome beast. In the upper photograph you see a mother sea-lion with her baby, as yet still in the long fur which clothes it for its first few days of life. Below, a grand old sea-elephant takes a look over the edge of his pool in some large zoo. He gets his name from his long nose.

Photos top Wide World bottom Mondiale



A SEAL ROOKERY ON AN ALASKAN ISLAND

This is a part of the largest remaining herd of fur seals, estimated at 1,000,000 individuals, which make the Pribilof Islands their summer home. Ages ago probably all seals were land animals, but now they come to land only to breed and rear their young. Each year, about the first of May, the adult males land, and pick out their places on the shore. Late comers are driven away and forced to seek less desirable situations. A month later the "cows" begin to arrive.

it has no external ears. Two species are known, one on islands on the borders of the Antarctic Ocean, the other on the Pacific coast of Upper and Lower California. Their name is derived from the male's flexible snout or trunk, which, when relaxed, hangs 9 or 10 inches below the muzzle.

The southern sea elephant (*Macrorhinus falcatus*) sometimes measures over 20 feet in length, with a circumference of 18 feet round the chest. At the beginning of the 19th century they were found in great herds in the islands about the extremity of South America, but, on account of the excellent oil they produce, hunters have greatly reduced their numbers. They move with ease and grace in the water, and emit a roar something like the bellowing of an ox. On shore they are sluggish. When attacked, they are panic stricken, and unable in any case to escape because of their clumsy bodies and flippers.

Sea-serpent. The early literature of many nations abounds in stories of sea serpents, but these, like more modern and better documented accounts, are easily traced to some such monster as the giant squid. For these are the only known animals whose arms can be made to assume the form of a serpent. The expanded end of one of its two longest tentacles, when held just above the surface of the water, may easily be mistaken for the head, and the wavy tentacle itself for the body of the serpent.

The supposition that giant squids are the sea serpents of myth and fable is supported by the fact that these squids are found in the regions in which sea serpents are said to have

been seen. Norwegian sailors have affirmed that this serpent, or *kraken*, was able to lay hold of the strongest man-of-war and pull it down to the bottom of the sea! In the year 1680, it is said, a *kraken* came into the waters that run between the rocks and cliffs of the shore near a certain parish in Norway. Extending its long arms, it caught hold of some trees standing near the water and entangled itself in some openings or clefts in the rock, and stuck so fast therein that it could not work itself out, and, after a terrific struggle, perished.

Stories of sea serpents are current among fishermen on the Grand Banks of Newfoundland to this day, some of which seem quite reliable, and indicate that the giant squid may at times be a source of danger to human beings. At the same time, however, there are some accounts which do not seem so well explained, and in many cases giant ribbon-fish may be responsible. A great stir was caused in 1934 by the "Loch Ness Monster," a creature also classifiable as a "sea serpent."

Seasons. One of the most joyful times of the year for northern peoples is the season of the spring equinox (March 21), when the sun "crosses the equator." Warmth and daylight are increasing, and everyone feels that spring and summer are at hand. Six months later the sun "crosses the line" going south (autumnal equinox, about Sept 22) and winter is at hand.

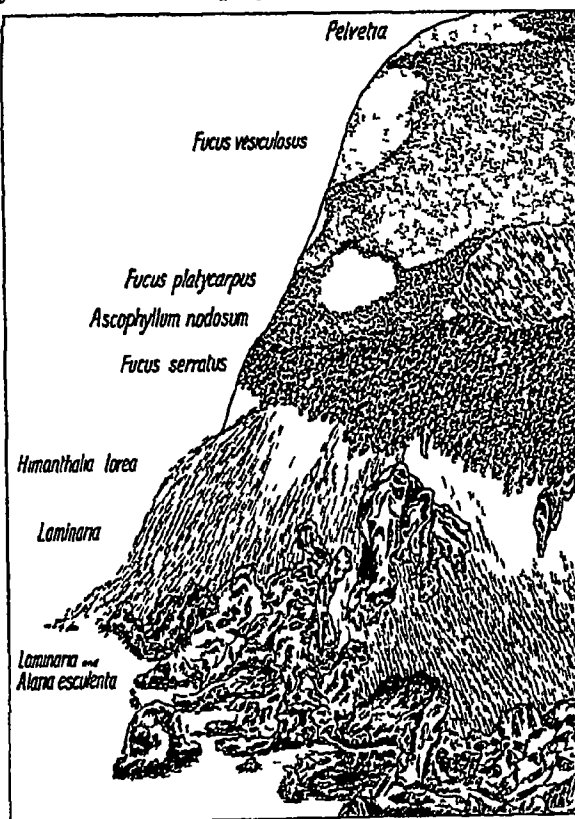
This relation between the movements of the sun and the four seasons (spring, summer, autumn, and winter) is caused by the fact that

the earth's axis tilts $23\frac{1}{2}^{\circ}$ from the perpendicular to the plane in which the centres of the sun and earth and the earth's orbit lie. Therefore, during half the year, the north half of the earth is less sloped away from the sun, and receives more than average heat and warmth, while the reverse is true during the other six months. Exactly the opposite conditions obtain, of course, at any given time, in the Southern Hemisphere. This is why we are able to play cricket test matches in Australia at Christmas.

Each of the four seasons has its own characteristics. Spring is the time of awakening, when the sap rises in the trees and the tender green buds break open. Summer is the time of fullness. Most of the flowers and trees are at their best, the weather is hot and thunderstorms are in the air. Autumn is the time of ripening and harvest, the season of beautiful rich colourings, the herald of the cold winter months of privation, quiescence, and retirement. Americans call the autumn the "fall"—the season when the leaves fall off the trees.

It is easy to understand such facts as the variation in the length of "longest days" at different latitudes. Day and night (ignoring dawn and twilight) are always 12 hours long at the equator, six months long at the poles, and the longest day varies between these limits according to latitude. It lasts 12 hours 35 minutes 10° away from the equator, is 13 hours 13 minutes long at 20° , 13 hours 56 minutes at 30° , 14 hours 51 minutes at 40° , 16 hours 9 minutes at 50° , 18 hours 30 minutes at 60° , and 24 hours long twice a year at $66\frac{2}{3}^{\circ}$ (the Arctic Circle and the Antarctic Circle). From there the number of 24-hour days increases up to half the days of the year at the poles. These times are slightly longer than stated in the Northern Hemisphere, and shorter in the Southern, because at the summer solstice the earth is also at *aphelion* (farthest from the sun). Here, according to Kepler's laws (see Kepler, Johann), the earth travels more slowly in its orbit than when at *perihelion* (nearest the sun), which is at the time of the winter solstice.

Hence the earth need not rotate as much (or as long) during the northern summer to bring a point on its surface from night into daylight as it does during the southern summer, when the point has been carried farther along the orbit during the night. This explains why actual sun time (apparent solar time) lags as much as $16\frac{1}{2}$ minutes behind the clock (mean solar time) six months a year, then speeds as much as $13\frac{1}{2}$ minutes ahead for six months. (See Time)



SEAWEEDS IN SEQUENCE

This is the key to the picture in the opposite page

Seaweed. A great floating meadow of sea weed—the famous Sargasso Sea—almost as large as a continent, lies in the North Atlantic Ocean. It has been massed together by winds and ocean currents, probably from the Caribbean Sea and Gulf of Mexico. It is a tangled fairy forest, the resting-place for wandering birds, and the home of tiny fishes, molluscs, crabs, jelly fish, sea-worms, and other many coloured deep-sea creatures. Through this sea the ships of Christopher Columbus sailed for two weeks on his first voyage of discovery to the New World. But the tales of ships becoming stuck for ever in it are impossible, since it is neither

continuous nor thick enough to hold them.

Similar floating islands of seaweeds exist in the Pacific and Antarctic Oceans. They are composed chiefly of "gulf weed," a long, many-branched plant buoyed up by little air-bladders.

They are useful as well as interesting and beautiful—these plants of the sea. Not only do they form breakwaters that prevent the wear and tear of waves on the coast, and sometimes make natural harbours, not only do they serve the useful purpose of throwing off oxygen and keeping the water pure, but they also form the real basis for ocean life, since the larger water creatures live on the smaller ones which feed upon seaweed.

The giant kelps are sometimes 150 feet long, and have tough, feathery, root-like branches. Kelp ash was formerly an important source of the alkalis used in manufacturing soap and glass, and the chief source also of iodine. Nowadays its chief value is as a fertilizer, since its rich potash content makes it a valuable food.

SEaweeds' SEQUENCE BETWEEN THE TIDE-MARKS



Like plants growing up a high mountain, the seaweeds take up a definite sequence at different levels, their limits, in this case at least, being the marks between high and low tide. Each level has its characteristic type of weed, as you can see in this fine photograph, the names of the species you will find in the key in the opposite page. It is rare to find the sequence so well shown as this, for it is only when a great difference between the tides occurs, together with a large steep expanse of rock, that opportunities for studying the whole sequence at one time and place arise.

Photo Robert M. Adam

SEAWEED

for worn-out soils The gigantic kelps along the north-west coast of America were once used by the natives as ropes, and the huge bladders, as large as kegs, served as water bags

Many varieties of seaweeds, such as "Irish moss" or carrageen, are edible, containing a considerable proportion of gelatinous nutriment as well as valuable iodine Cattle and horses used to rough pastures thrive on it Many hundreds of tons of Irish moss are gathered at low tide along the rocky coasts of Ireland

Seaweed, when suitably dried, has also been used for stuffing mattresses, chairs, and couches in the manufacture of paper and a kind of gelatine, and sometimes all sorts of little dolls and baskets and trinkets are formed out of dried kelp (See also *Algae*, *Plant Life*)

Secretary. Broadly speaking, there are three classes of secretary the private secretary, the commercial secretary, and the official secretary Any busy man, such as a successful author or a business magnate, needs a really capable person to lift from his shoulders such routine work as reading and answering correspondence, and to act as an intermediary between him and his clients or the public These duties fall to the private secretary She (for private secretaries are nearly always women) must be a first-class shorthand-typist (See *Shorthand*) She must understand and have a flair for the work which her chief is doing She must be extremely capable, and able to take over almost complete responsibility in the absence of her chief

Duties of a Company Secretary

Likewise the commercial or company secretary (who is generally a man) needs to be far more than a shorthand-typist He must have a thorough knowledge of every aspect of the trade, however technical its branches may be A great deal of the financial responsibilities and administrative work of the firm will fall to his lot, as well as many of the duties that a private secretary normally fulfils A knowledge of modern languages and company law and procedure is particularly useful, since the chairman and directors rely upon the secretary for guidance in conducting the affairs of the company

The official secretary needs far more than a business head and administrative ability In order to hold a position of national importance in the Government such as Parliamentary Secretary of State, Under Secretary of State, or Parliamentary Secretary, an outstandingly brilliant political career and a master brain are required rather than mere technical qualifications and specialized knowledge

The Chartered Institute of Secretaries, at 6, London Wall, London, E C 2, and the Incorporated Secretaries' Association, 21, Bedford Square, London, W C 1, are the chief examining

SECRETARY BIRD

bodies for company secretaries All over the country there are technical institutes, commercial institutes, evening classes, and commercial colleges that give instruction to fit people for the position of private secretary **Secretary Bird.** These birds are of great value as destroyers of vermin, for their diet includes frogs, insects, lizards, small tortoises, and snakes They use their legs to hold snakes when attacking them, protecting themselves while so doing with their powerful wings They are found over the whole of South Africa, and as far north as the Sudan and Abyssinia

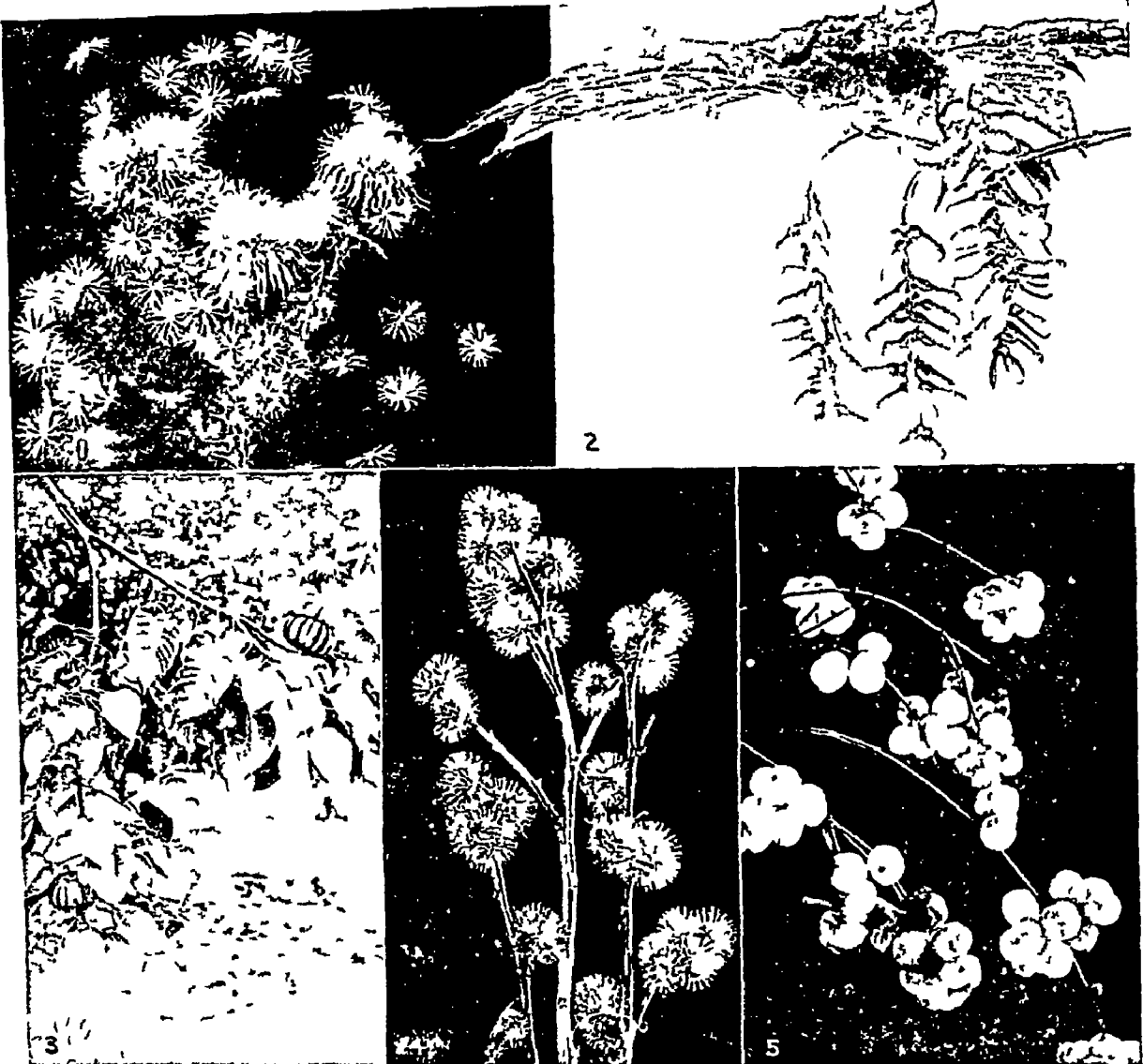
Secretary birds (*Serpentarius secretarius*) were so called because of a curious tuft of quill like feathers projecting from the back and sides of the head, reminding one of an old-fashioned secretary with quill pens behind his ear

The birds have very long legs and are about four feet tall, with a tail that reaches the ground The beak is strong and hooked, and



A SECRETARY BIRD'S BIG MOUTHFUL

One of the strangest of birds, the secretary bird earns its name from the feathers sticking up at the sides of its head which resemble the quill pen stuck behind a secretary's ear This one is in difficulties, for it has taken a large egg and is trying to swallow it at a mouthful



HOW PLANTS SCATTER THEIR SEEDS FAR AND WIDE

Plants have scores of ingenious ways of scattering their seeds so that the next generation may start life in fresh and unexhausted soil. Some plants and trees like the carline thistle (1) and the striped maple (2), trust to the wind to carry their seeds to fertile ground. The monkey's dinner bell (3) is more energetic, perhaps because it lives in the warmer parts of South and Central America; its seeds are contained in separate capsules which explode with a loud report and are shot far away from the seed cluster. The burdock seeds (4) spread by sticking to animals, and the snowberry (5) attracts birds which carry away the seeds sticking to their beaks or feathers.

the plumage a clear grey. They run with the speed of a horse, though they are also powerful fliers. They build bulky nests in trees or bushes. The secretary bird is classed in a family by itself, possibly related to the vultures.

Seeds and Spores. Travellers in the West Indies are sometimes startled by a report like a pistol shot, followed by a volley of large seeds rattling through the vegetation. This is the way the "monkey's dinner bell" or sand-box tree (*Hura*) has of scattering its seeds, so that when the new plants grow up they will not be crowded together on exhausted soil. Many other plants scatter their seeds violently to a considerable distance.

Many seeds or fruits are especially adapted for transport by wind. Dandelions and thistles grow tufts of soft hairs which float on the merest breath of air. Others have circular or paddle shaped wings, like the elm fruit or the "keys" of maple and ash, which twirl in the air or fall like a stone according to their design. Other seeds are so light that they are blown about like dust. Again, the seed head, or sometimes even the whole plant, twists itself into a globular basket, enclosing the seed pods, and rolls before the wind, carrying and scattering the seed broadcast over the countryside.

The fruits of many plants growing in or near the water are provided with life preservers

in the shape of air-filled coats or bladder-like floats, to enable them to travel on the water. The tough shell of the coconut is watertight and buoyant, and it drifts in the sea, uninjured, from tropical beach to beach.

Birds, animals, and even ourselves, by means of our clothing, act as seed carriers. Grasping hairs, barbed and sharp and hooked spines fasten seeds to animals' coats like "burrs," or are trodden upon, and often are carried for long distances before the annoyed beast can rid itself of them. Mud dried on the shanks of water-fowl has its quota of small seeds, and that is how a clear, new pond soon becomes filled with water plants from miles away.

Seeds are often sunk in the flesh of luscious gaily coloured fruits, which attract hungry creatures, especially birds. Sometimes this flesh is so sticky that the seeds are smeared on beaks, to be wiped off and planted far away, as in the mistle-toe, sometimes the seeds, as in the case of cherry stones, have coats so hard as to pass through the creature's digestive organs uninjured.

On the other hand, these birds must be prevented from attacking the young seeds and carrying them off before the proper time. The unripe flesh of edible fruits, for ex-

ample, is too green and hard or sour to tempt, and the thick husks of walnuts are filled with bitter tannin. Other fruits, or the bracts enclosing them, are armed with sharp prickles and spines, as we are painfully aware when we handle an unripe horse chestnut or a closed thistle-head.

Moreover, the food provided within the seed for the infant plant is often rendered unpalatable by bitter and curious flavours, some of which we have come to like, as those of chocolate and coffee. Nutritious starches and useful oils and drugs are found there also, and even poisons.

To get an idea of how a seed is constructed, remove the coat from a bean. At once you will notice that the "embryo" or young plant

within has two main parts which you can easily separate. These are called seed-leaves or "cotyledons," and their purpose is to provide nourishment for the young plant when it first emerges from its seed-coat and before it has had time to unfold its leaves and push its roots into the soil to secure its own food.

Besides the cotyledons, the embryo has other smaller parts, which will develop into the roots, stems, and leaves of the mature plant. In some plants the cotyledons are too small to

provide much nourishment to the young seedling. In these cases the nourishment needed is furnished by the "endosperm," a starchy tissue which surrounds the embryo.

Some embryos have only one cotyledon instead of two. This difference is so important that botanists classify all plants with enclosed seeds (angiosperms) according to the way their seeds are made. Those with two or more seed-leaves are called "dicotyledons," those with only one are known as "monocotyledons."

Only the true flowering plants, the "spermatophytes," produce seeds. Most of the so-called flowerless plants, or "cryptogams," re-

produce by means of spores, which are merely little single cells. Unlike seeds, spores do

not contain any young plant or embryo. In earlier days it was a favourite joke to send youngsters on Midsummer Eve to hunt for fern-seeds, telling them that if the lucky finder put them in his shoe he would become invisible—as invisible as the elders thought the seed was, for they did not know that spores, hidden in the brown patches, or *sori*, on the back of the frond take the place of seeds. (See Ferns, Fungi, Moss)

Segrave, Sir Henry O'Neal DeHane (1896–1930). This famous racing motorist was born at Baltimore, U.S.A., of Irish parents, but he was educated at Eton College and Sandhurst, and achieved all his great feats as a world's speed-racing record-breaker as the champion of Britain.



SOARING SEEDS OF THE GOAT'S BEARD

The goat's-beard, which you see above, sends its seeds flying on downy parachutes to hunt for new homes, for if they fell into that tangled grass they would have no chance to grow. This is one of Nature's wise provisions for her "young."

SEGRAVE

On being invalided home from the Royal Flying Corps at the Front in 1916, Segrave became Technical Secretary at the Air Ministry. Shortly after the War he turned his abilities in the direction of motor racing, and soon became an "ace" of the speed track. In 1926, after winning numerous important races, he made his first successful attempt on the world's land speed record, reaching 152 m.p.h. at Southport. The following year he attained 203 m.p.h. on Daytona Beach in Florida, U.S.A.

The climax of Segrave's career came in March, 1929, when, at Daytona, he covered the measured kilometre in his all-British car, Golden Arrow, at 231 m.p.h., smashing the previous record held by an American by no less than 23 m.p.h. For this feat he was knighted by George V. Little more than a year later he put up a new world's record for motor boats (98 m.p.h.) on Lake Windermere, but was killed immediately afterwards when his boat, Miss England II, overturned. He was told of his last triumph as he lay dying on the bank.

Seine, RIVER (Pron sãn) Foremost in his toric interest of the rivers of France is the Seine, made world-famous through the development of Paris on its banks. It rises from six little springs in a wooded rocky dale among the hills of the old duchy of Burgundy in eastern France, and, after winding and twisting its way north-westward through a course of 482 miles, flows into the English Channel between the ports of Honfleur and Havre. Before reaching Paris, about 230 miles from the mouth, it flows past Troyes, Nogent, Melun and Fontainebleau, while below the great metropolis St. Denis, St. Germain, Mantes, and Rouen are situated on its banks.

The Seine near its source is a tiny rivulet that sometimes in summer becomes quite dry. Sustained by small tributaries, however, it increases to a vigorous brook, and farther on, as it receives in turn the waters of the Aube, the Yonne, the Oise, and the Marne, it develops into one of the four important rivers of France,

furnishing water-power for numerous large industries. It is navigable for small vessels for some distance above Paris.

The low elevation of the hills which bound its basin has made it comparatively easy to connect the Seine and its tributaries, by means of canals, with the Somme, the Schelde, the Meuse, the Saône, and the Loire. Deep dredging from its mouth to Rouen, a distance of about 50 miles, has made that city a seaport.

Selenium. This comparatively rare element was first isolated by Berzelius, the famous Swedish chemist, in 1817.

In the dark, it is a poor conductor of electricity, but let a beam of light strike it and its conductivity instantaneously increases in direct proportion to the light's intensity. Enclosed in a suitable cell to shut out other influences and connected in an electrical circuit with a galvanometer, a thin film of selenium becomes, therefore, a device for measuring the brightness of any light that passes through the cell window. Furthermore, it enables us to translate variations of light into variations of electric current, which can in turn be translated into sound by telephonic methods.

Before he invented the telephone, Bell experimented with the "photophone," in which the voice made a beam of light vibrate over a distant selenium

cell receiver. The "optophone" is a selenium device to help blind people to read. It enables the reader to "hear" the light variations coming from the letters.

Selenium cells have been used to measure sunlight, moonlight, and the feeble rays from stars beyond our ordinary vision, to control traffic lights, and to turn harbour beacons on at night and off at dawn, and to transmit pictures by telephone and wireless. In recent years, however, their place has been largely taken by photo electric cells because the latter are usually more rapid in their response to light changes (See Photo electric Cells). The chemical properties of selenium are useful in controlling the colour of glass. In small quantities it yields a



SIR HENRY SEGRAVE *Central Press*

On Major Henry Segrave world's speed racing record-breaker, King George V conferred a knighthood in recognition of his feat in breaking the world's land speed record on Daytona Beach, Florida, in 1929.

pink tinge that counteracts the green from iron impurities. In larger quantities it produces the kind of red glass used in traffic lights.

Most of the world's selenium is a by-product of copper refining.

Sentence. A sentence is a group of words expressing a complete thought. A speaker or writer who makes a sentence must have something to think about, and he must single out some fact concerning it which interests him, and assert that fact or ask a question about it.

The part of the sentence that represents what is talked about or written about is called the *subject*. All the rest of the sentence, which asserts something, is called the *predicate*.

The complete subject of the sentence always contains a noun or pronoun, or a group of words used like a noun, which stands for the thing talked about. This is called the *subject substantive*. It may or may not have adjuncts or modifiers. In the sentence "People who live in glass houses shouldn't throw stones," the word *people* is the subject substantive. It has as a modifier the clause *who live in glass houses*, showing which people are meant. The complete subject is *people who live in glass houses*.

The predicate of a sentence must always contain a verb. (See Verb.) Sometimes this verb by itself says all we want to say about the subject, as "The water boils." But often we want to add to the meaning of the verb, as "Water boils more rapidly if you make the fire hotter."

Certain verbs require other words to complete their meaning. Linking verbs, such as *be*, *become*, take a *predicate* noun, pronoun, or adjective to complete their meaning. Transitive verbs, that is, those that express an action as affecting someone or something other than the subject, must have an *object*. This object may be one word or a group of words, as "The water burned me", "He said that the water was cold."

Functions of Phrases and Clauses

Any or all of these necessary or essential elements of the sentence may be made more clear and interesting by the use of modifiers or adjuncts. These are either single words, phrases, or clauses. A *phrase* is a group of words not consisting of a subject and a predicate, and used like an adjective, an adverb, or a noun as *under the tree*, *finding gold at the rainbow's end*, *to stay here*. A *clause* is a group of words consisting of a subject and predicate, combined with another such group to make a single sentence. For example, "I came, I saw, I conquered" is a sentence consisting of three clauses, each of which might stand by itself as a single complete sentence.

Clauses which are of principal and equal importance in the sentence are called *co-ordinate* clauses. Clauses which are dependent on some other member of the sentence are called *sub-*

ordinate. Subordinate clauses may be used like adverbs, to define the meaning of the principal verb ("I shall come *when I am ready*"), like adjectives, to define the meaning of a noun or pronoun ("This is the house *that Jack built*"), or like nouns ("He told me *what I wanted*").

Three Forms of Sentence

According to their form, sentences are *simple*, *compound*, or *complex*. A *simple* sentence is a sentence that consists of one proposition. Either its subject or its predicate or both may be compound, as "Bread (and) potatoes are starchy foods", "People *need certain food elements* (and) *usually enjoy the proper combinations of these*", "Both men (and) animals *require abundant fresh air* (and) *grow weak in confinement*".

A *compound* sentence is a sentence that consists of two or more independent propositions or clauses, as "I came, I saw, I conquered". Propositions should not be joined in a compound sentence unless they are closely related in thought. The members or parts composing a compound sentence are usually joined by a co-ordinating word called a *conjunction*.

A *complex* sentence is a sentence consisting of a main proposition or clause and one or more subordinate clauses, as "Wait *till he comes*", "Between the dark and the daylight, *when the night is beginning to lower*, comes a pause in the day's occupations, *which is known as the children's hour*".

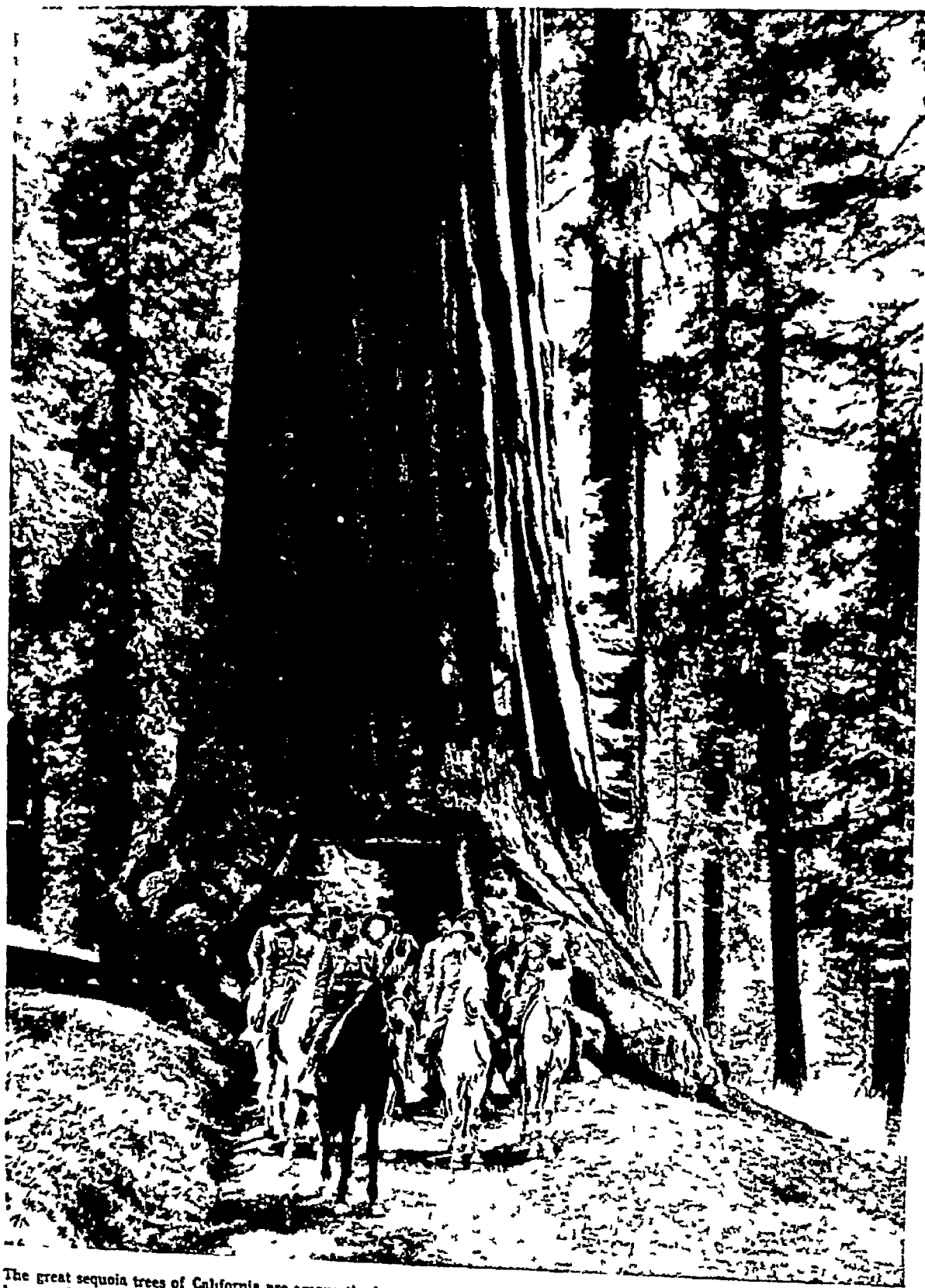
Now, in nearly all the sentences we have talked about so far, the predicate states or declares something about the subject. We call such sentences *declarative* sentences.

But there are also three other kinds of sentences, distinguished according to meaning. There is the kind that asks a question, as "Which is the largest city in England?" These question-asking sentences are called *interrogative*. Another kind of sentence commands someone to do something, as "Everybody come in!" We call this sort of sentence *imperative*, and often put an exclamation mark (!) after it. Then there is another kind of sentence that we use when we want to express strong feeling about something. For example, if you are surprised to wake up in the morning and see a heavy fall of snow, you exclaim, "What a lot of snow has fallen!" Such a sentence is called *exclamatory*.

Sequoi'a. There are two species of these giant conifers—the mammoth tree (*Sequoi'a gigantea*), in England usually called Wellingtonia, found on the western slopes of the Sierra Nevada in California, and the redwood tree (*S. sempervirens*) of the Coast Range, which is its only rival in size and grandeur.

The mammoth tree occurs in forests and in isolated groves. "In stature they are imposing

GIGANTIC SEQUOIA TREE OF CALIFORNIA



The great sequoia trees of California are among the largest living things in the world, and the one you see here is one of the biggest of all. This is the famous "Wawona," through which a tunnel has been cut large enough, as you see, to allow a troop of horsemen to pass through, two abreast. This tree is 227 feet in height and the diameter of the bole is twenty six feet. In Britain the sequoia rarely exceeds 100 feet in height.

Keystone

as is no other living thing, in age they are a measure for the centuries, in situation they are stranded on the flanks of a mountain range where they are able neither to retreat nor to advance, and in number they are comparatively few." The trees of this species were visited first by a white man in 1841, really discovered in 1852, and introduced into England in 1853. Here they caused a sensation, and soon every country gentleman of any pretensions grew one or more. That is why you can see them in parks and gardens all over the south and west of England, though elsewhere they are not hardy.

In their native range these remarkable giants grow from 200 to 350 feet high, with an average diameter at the ground of 20 feet. They have a bright cinnamon-coloured fluted trunk, which may rise branchless to a height of 180 feet. The crown is narrow and cylindrical, clothed in long sharp-pointed evergreen foliage, from which hang scaly reddish-brown cones. The tops of the very old trees are much broken from the weight of snow and windstorms. From the annual rings in the wood the age of the largest trees yet felled is known to be from 1,100 to 1,500 years.

One famous mammoth tree is 93 feet in diameter, and another mighty tree has a tunnel through its base through which a troop of horsemen can ride. The dark red wood of the mammoth trees is light and extraordinarily durable, but they are now under the protection of the State and may not be felled.

The redwoods thrive only in the fog-drenched forests near the coast. Their foliage, which rather resembles that of the yew, lies in flat sprays, and the inch-long cones are borne in clusters, usually in the top of the tree. These trees are of about the same dimensions as the Wellingtonia, they are also grown, though less often, in Britain, reaching over 110 feet.

Serbia. The Serbs first settled in their mountainous land, now the northern part of Yugoslavia, in the 7th century. The Turkish

rule began with the defeat of the Serbs in the great battle of Kossovo in 1389, and was maintained with such cruelty that many of the people emigrated to southern Hungary. After more than four centuries of tyranny a group of Serbian patriots organized a rebellion and elected George Petrovitch (called Karageorge or Black George) as their leader (1804). They recovered the district about Belgrade, but were soon forced to flee from the Turkish forces sent against them. In 1815 a second rebellion was organized by Milosh Obrenovitch, who succeeded in establishing the autonomy of the Belgrade

government (1829) and proclaimed himself hereditary prince. When Karageorge returned to Serbia he was assassinated by order of Prince Milosh.

The next half century was spent in feuds between the rival houses of Karageorgevitch and Obrenovitch, and attempts to free more Serbian territory from the Turks. The long struggle ended in 1878, when, following the Russo-Turkish War, complete independence was conferred upon Serbia by the Congress of Berlin. In the Balkan Wars of 1912-13, against Turkey and Bulgaria, Serbia almost doubled her territory. Peter I, of the Karageorgevitch family, came to the throne in 1903, following the assassination of King Alexander and Queen Draga, of the rival dynasty.

Unfortunately Serbia blocked the "corridor" by which Austria-Hungary hoped to reach the Aegean and dominate the Balkans. The result was the series of events which led to the Austrian ultimatum to Serbia on July 23, 1914, and the World War. (See the article on the World War of 1914-1918).

After the World War the whole of the South Slav race was united in the Triune Kingdom of the Serbs, Croats, and Slovenes, later (1929) the Kingdom of Yugoslavia (*g v*), with Serbia as the dominant part, and its chief town, Belgrade, as the capital of the new State. In addition, the Karageorgevitch dynasty became the ruling family of Yugoslavia.



PETER I OF SERBIA

Peter Karageorgevitch, son of Alexander I, Prince of Serbia, was born in 1844. In 1883 he married the daughter of Nicholas I of Montenegro, and he was elected King of Serbia in 1903. He died on August 16, 1921.

SEVEN WONDERS

SEVEN WONDERS of PAST & PRESENT

Only one of the "Seven Wonders of the Ancient World" known to Alexander the Great still stands. The modern world contains many more than seven wonders, but which would you choose as the seven greatest?

Seven Wonders of the World.

Of the marvellous works of Man of ancient times the sightseers of the time of Alexander the Great generally regarded the following seven as the most wonderful

(1) The Pyramids of Egypt, (2) the Hanging Gardens of Babylon, (3) the Temple of Diana at Ephesus, (4) the Statue of Zeus at Olympia, (5) the Mausoleum at Halicarnassus, (6) the Colossus at Rhodes, (7) The Pharos (lighthouse) of Alexandria. We still marvel at the massive Pyramids, which stand as solid as ever after the wear and tear of centuries. (See Pyramids) Except for fragments of the Mausoleum and the Temple of Diana, they are the only "wonder of the world" that remains today.

The hanging gardens of Babylon have long since disappeared. They were said to have been built by King Nebuchadrezzar (about 660 B.C.) to please his favourite wife, who had come from a hilly land and wearied

of the flat plains of Babylon. Great terraces of masonry, from 75 to 300 feet in height, were built one on top of the other, and on these were planted gardens of gorgeous tropical flowers, and groves and avenues of palm trees, irrigated by water pumped from the river Euphrates. (See colour plate fac p 377)

The statue of Zeus was erected at Olympia, in the Peloponnesus, Greece, by the great sculptor Pheidias, in the 5th century B.C. It was a towering structure of ivory and gold, 60 feet high, no less remarkable for its majesty and beauty than for its richness and size. It has utterly perished, and our only idea of it is gained from coins of Ephesus which

are said to bear copies of the original. (See colour plate facing page 1944)

Excavations on the site of the ancient Greek city of Ephesus, in Asia Minor, have revealed fragments of the pavements, columns, and sculptures of the Temple of Diana. The first Greek settlers at Ephesus found the Asiatic inhabitants worshipping a Nature goddess, whom they identified with their own Artemis (called Diana by the Romans). They raised a shrine to her, which was rebuilt and enlarged from time to time. The fifth temple is the one which, from its height, was regarded as the "Wonder." Probably completed by about 300 B.C., it stood until A.D. 262, when it was sacked and burned by the Goths. The great sculptured drums of the lower part of its 60-foot columns, are now in the British Museum. (See illustration below)



KING KHUFU

The Pyramids of Egypt were among the Seven Wonders of the Ancient World, and above is the bust of King Khufu, the builder of the Great Pyramid of Gizeh.

Egypt Exploration Society

The Mausoleum at Halicarnassus—also in Asia Minor—derived its name from King Mausolus of Caria, who died

about the middle of the 3rd century B.C. His wife, who was devoted to his memory, employed

Greek architects and sculptors to construct and decorate this superb monument over his remains. It was a great rectangular pile of masonry, surmounted by an Ionic colonnade, which supported a roof-like pyramid. On the top of this pyramid stood a magnificent four-horse chariot, in which were statues of the king and queen. The statue of Mausolus was nearly ten feet high, it showed the king with thick flowing locks and a short closely trimmed beard.

So famous did it become that the word "mausoleum" is now often applied to any



FRAGMENT OF THE THIRD WONDER

In the British Museum stands this fragment from the Temple of Diana at Ephesus, the third of the Seven Wonders of the Ancient World. It probably represents the legend of Hermes leading Alceste back to the world of light.



British Museum

COMMEMORATED BY THE FIFTH WONDER

Our word "mausoleum," meaning an imposing sepulchre, is derived from Mausolus, King of Caria, to whose memory Artemisia, his wife, raised the magnificent tomb, for centuries a glory of Halicarnassus, and the fifth of the Seven Wonders. These draped figures of the royal pair are said to be the work of the noted Greek sculptor and architect, Pythius.

monumental tomb. Some of the remains of the original Mausoleum at Halicarnassus are now preserved in the British Museum.

The Colossus of Rhodes was a huge statue of the sun-god Helios, erected in 280 B.C. at the entrance of the harbour of Rhodes, an island in the Aegean Sea, near the south-western coast of Asia Minor. It was built of bronze and was about 100 feet high. According to the usual belief, it stood astride the entrance, and it is often so represented in pictures, but, as a matter of fact, it probably stood at one side of the entrance. It was overthrown by an earthquake in 224 B.C., and, after almost a thousand years, the remains were collected together and sold for old metal.

Pharos was originally the name of an island lying off the coast of Egypt, close to Alexandria. When Alexander the Great laid out this city to which he gave his name, he connected the island of Pharos with the mainland by means of a causeway. On the eastern point of the island, Ptolemy II, king of Egypt, erected a great lighthouse of white marble, said to have been about 500 feet high, and it was this structure, completed about 260 B.C., which came to be known by the name of "the Pharos of Alexandria."

Amazing as were these wonders of the ancient world, they pale before the wonders of modern times. The Pyramids, mighty as they are, are equalled by such structures as the locks of the Panama Canal and the great dam at Assuan.

But the real "wonders" of today are the amazing and beneficent triumphs of modern scientists over Nature—their discoveries and inventions, which enable men to fly like the birds, talk across thousands of miles without wires, conquer disease, and perform every day and every hour feats which exceed the wildest fancies of the ancients. Some time ago a magazine took a vote of its readers as to what the seven modern wonders are. Here is the list that was chosen: (1) wireless, (2) the telephone, (3) the aeroplane, (4) radium, (5) anaesthetics and antitoxins, (6) spectrum analysis, and (7) X-rays. What is *your* list?

Seven Years' War (1756-63) When Frederick the Great of Prussia, in 1740, seized the Austrian province of Silesia, he set off a powder mine that had been laid by the world-wide rivalries of European powers and alliances.

In the War of the Austrian Succession (1741-48) Maria Theresa, the courageous young ruler of Austria, made two vain attempts to recover her stolen lands. (See Maria Theresa.) Then, in 1756, having won new support among the powers of Europe, she decided to try a third time. But before she and her allies could strike a blow, Frederick the Great invaded the neutral but unfriendly land of Saxony, and so himself began the Seven Years' War.

On the one side were Austria, Russia and France, and on the other were Britain, with its navy, and Prussia, with its well-prepared army.

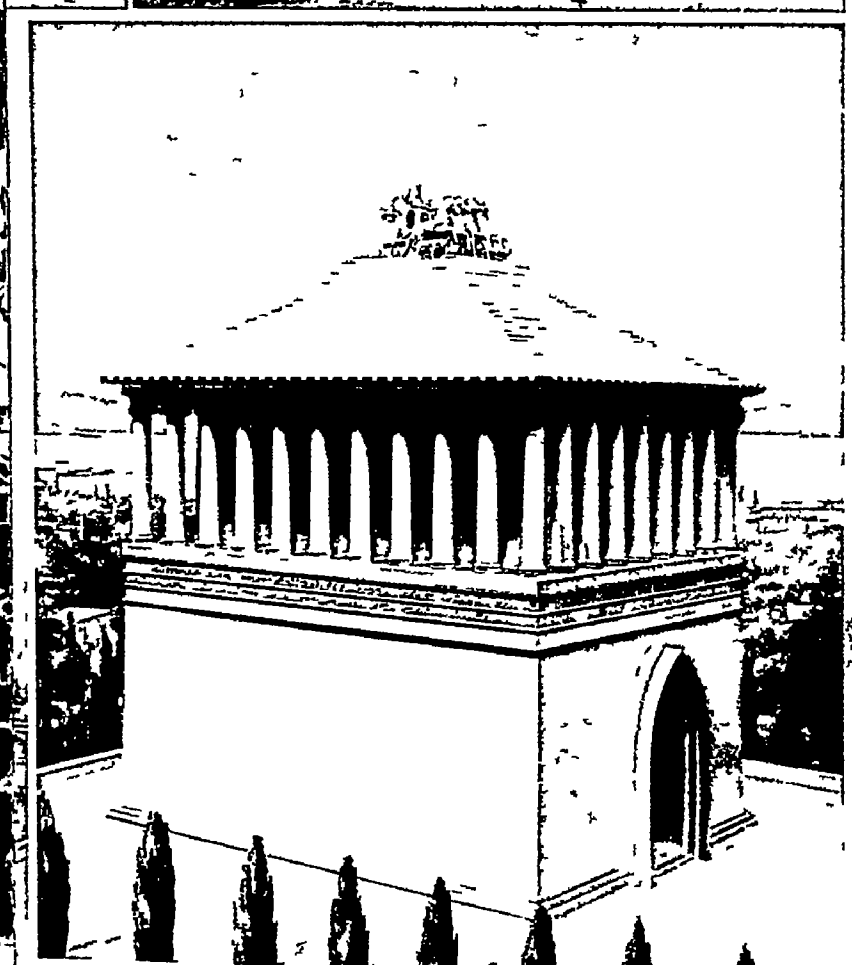
At the outbreak of the war Frederick made himself master of Saxony, and defeated the French and Austrians in perhaps his most famous battle—Rossbach. A month later (December, 1757) he routed the Austrians at Leuthen.

Through the varying fortunes of the two succeeding years Frederick's military genius enabled him to wrest victories from his enemies and hold the balance even in Europe, while Pitt directed the forces of England to triumph in America and India.

Then George III came to the English throne, in 1760. The genius of Pitt made him uncomfortable. The great minister was forced to resign in 1761, and shortly afterwards the money subsidies which England had been paying to Frederick ceased.

Frederick's straits were somewhat relieved in the following year, when Elizabeth of Russia died and Peter III, her successor, in his few months' reign, made peace with Prussia. Sweden and France fell away from the alliance, and finally Austria, too weak to carry on the war alone, made peace with Prussia at Hubertsburg.

MIGHT OF THE ANCIENT WORLD



Top (1) The Pyramids of Egypt, which

(5) The Pyramids

Bottom (4) The Statue of Zeus which was erected at Olympia by the sculptor Pheidias
Mausolus, erected at Halicarnassus by Artemisia, his wife.

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SEVEN YEARS' WAR

(February 15, 1763) Silesia, which had been acquired by Prussia in 1742, was confirmed as a possession of Frederick

In America the conflict had begun the year before it broke out in Europe. The French made the first move by beginning the building of a chain of forts extending from the St. Lawrence to the Mississippi. The land they were thus occupying was claimed by the colony of Virginia under her "sea to sea" grant from the English Crown, so the governor of the colony dispatched a small force under young George Washington to capture the French post, Fort Duquesne, on the present site of Pittsburgh in Pennsylvania. The expedition was unsuccessful, and Washington had to surrender to superior forces.

The next year (1755) was still more disastrous. General Braddock, who had been sent from England with a strong force of British regulars, was heavily defeated and his army almost destroyed in his advance upon Fort Duquesne. He himself was mortally wounded, and his army would have been totally destroyed had it not been for Washington's skilful management.

During the two years following Braddock's defeat the English colonies were hard pressed, and the Indian allies of the French plundered settlement after settlement along the border. But in

1758 the tide turned. William Pitt sent out a well-equipped army and fleet which, with the assistance of the colonial troops, broke the line of French forts. In the next year Wolfe captured Quebec, dying in the hour of victory.

British Victories in India

In India British prowess met with similar good fortune. The East India Company had founded settlements for trade, which gave promise of extending to an empire, but France endeavoured to snatch the prize.

Dupleix, the able French governor of Pondicherry, captured Madras, and attempted to make French power supreme over the country. He was checkmated by the stupidity of the corrupt French court, which sent him no support, and by the genius of Robert Clive (*q.v.*), who from a clerkship in the East India Company rose to be the founder of British rule in India.

The prolonged and desperate struggle in America and in India ended in the Peace of Paris, a few days before the treaty which closed the conflict in Europe (February 10, 1763). France ceded to Great Britain the whole of Canada, together with various islands in the West Indies. Spain, which had been drawn into the war on the side of France, ceded Florida to England (which held it until 1783), while France



HAWKE'S VICTORY AT QUIBERON BAY

During the Seven Years' War the French planned an invasion of England. The troops were to be conveyed by the fleet of the French admiral, Conflans, who set out from Brest on November 14, 1759. In Quiberon Bay, six days later, a great naval battle took place between the English fleet, under Admiral Sir Edward Hawke, and the French, in which the French fleet was utterly broken and their flagship *Soleil Royal*, driven ashore and burned. Here is the conflict as pictured by Sir Joseph Paton.

compensated Spain with the cession of the Louisiana country west of the Mississippi

From the Seven Years' War Prussia emerged triumphant and stamped with the military prestige and doubtful diplomacy of Frederick. The Prussian-Austrian struggle for leadership in Germany was now fairly begun. France, shorn of her colonies and with diminished prestige in Europe, was heading for revolution unless vigorous reforms saved her. Great Britain had acquired a world empire on which the sun never set and the colonies in America had a new conception of their own power and place in the British Empire.

Seville, (Pron sev-il'), SPAIN. It is said that there is never a day when the sun does

not shine in Seville, "the pearl of Andalusia," the most Spanish of cities, whose palms and gardens are always green along the brown course of the Guadalquivir. Roses bloom the year round, and olive trees, oranges, and vines flourish exceedingly.

Though there are many fine broad modern boulevards, in the older quarters the streets are crooked and sometimes so narrow that a donkey's swinging baskets of fruits and vegetables touch the house walls on either side. The whitewashed houses have balconies that overhang the street, and through the open gateways one catches glimpses of *patios* or courtyards of an oriental pattern, with fountains and orange trees and trellises of flowers. In

such ancient streets life goes gaily on as in the days of old, to the strumming of guitars and the clicking of castanets. Four of the best-known operas have sought to catch the colour and gaiety of street life in Seville: Mozart's "Marriage of Figaro" and "Don Giovanni," Bizet's "Carmen," and Rossini's "Barber of Seville."

The famous Alcazar, in spite of much rebuilding, remains an example of Moorish fortress-palace comparable only to the Alhambra at Granada—a place of gardens and lofty arabesqued halls and courts.

Seville possesses magnificent architecture of the Christian type as well, notably its cathedral, which is one of the largest Gothic temples in existence. Begun in 1402, its construction took over a hundred years. From the Moorish mosque of earlier days it retains the beautiful Court of Oranges, and the Giralda, once a minaret, now a belfry. It contains the tomb of the great discoverer



Keystone

SUNSHINE IN SEVILLE

The architecture of Seville, capital of Andalusia, clearly shows the influence of long Moorish occupation. Here, from a balcony with a fine balustrade of Spanish iron-work, is seen the Plaza de la Constitucion. In the background are the cathedral and the Moorish Giralda tower.

Christopher Columbus In the cathedral, in the museum, the hospital, and elsewhere one is surrounded by works of the painter Murillo, who, like another famous painter, Velazquez, was born in Seville

Seville ships wines, olives, oils, oranges, and ores, for, although nearly 60 miles from the sea, it is Spain's fourth largest city and has been an important seaport from the earliest times, since the Guadalquivir is a tidal stream even above Seville, and admits ships of considerable draught For many years Seville had a monopoly of the American trade, thereby becoming the richest port of Spain

It was an important centre in Roman times, and part of its water supply is still brought by a Roman aqueduct It passed into the hands of the Vandals and the Visigoths, and in A D 712 it was captured by the Moors, remaining a Moslem city until its recapture in 1248 by Ferdinand III of Castile

Since before Roman times, Triana, a suburb of Seville on the right bank of the Guadalquivir, has made pottery Other important industries are the manufacture of tobacco, chocolate, soap, corks, iron, and silk Seville has a famous university The population of the city is about 219,000

MAKING & MENDING *with the* NEEDLE

Here is given an introduction to one of the most useful of the domestic arts, patching, hemming, darning, sewing on buttons—these are humdrum tasks, but ones that every girl should be mistress of

Sewing. The art of making garments with the aid of needle and thread has been carried on for centuries Many different stitches can be used, and the essential ones are tacking, running, hemming, herringboning, slip stitching, oversewing, overcasting, buttonholing, and darning, all of which are explained below

A very good way of learning to sew is to begin with mending Here are the things you will need if you are going to do all kinds of mending

1 A pair of small sharp scissors

2 One large, one small, and one darning needle

3 Darning silks or wools in the colours of the stockings, etc

4 A darning egg or mushroom

5 Number 40 white and black cotton thread for sewing on all descriptions of buttons

6 Old muslin for patching

7 Number 60 white and black thread for sewing on torn lace

8 A tape measure

9 A thimble

10 A packet of pins

TACKING—Tacking is used to hold two edges of cloth together, or to hold a patch on until you do the finer stitches that will stay in and make the mending strong Then you pull the tacking thread out

As in Fig 1, put your needle *down* through the cloth at number 1, then *up* through the cloth at number 2 This will bring the needle through

to the right side Then take your needle to number 3 and put it down at 3 to the wrong side, and up through 4 to the right side Now go to 5 and do the same with each stitch Hold the two pieces of cloth firmly together so that they will not slip, and be sure at each stitch that your needle goes right through both pieces of cloth

RUNNING—Running stitches are used when making seams The stitches are made in a

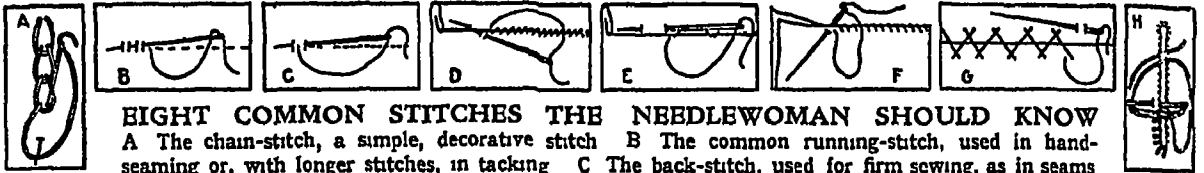
somewhat similar way to tacking stitches, except that, instead of making short and long stitches alternately, the running stitches are all short and of even length

HEMMING—Hemming is used to neaten the edges of garments To prepare for hemming be sure that the edge of the cloth to be hemmed is straight Make a folded edge about a quarter of an inch wide Then fold over again, this time as wide as you want the finished hem to be If you are making a hem more than half an inch wide, it is best to measure every few inches, as you fold, with a piece of stiff cardboard

When the hem has been folded, tack it in place Then, holding the fold towards you and the free edge hanging down, push the needle under the fold, at the right-hand end, taking up a very little of the folded edge of material, and pull the thread through until about 1½ to 2 inches are left, tuck this just under the fold Now take up two or three threads of the single cloth and two or three threads of the fold (slanting the needle towards the left shoulder) and pull the needle through



Fig 1—Tacking



EIGHT COMMON STITCHES THE NEEDLEWOMAN SHOULD KNOW

A The chain-stitch, a simple, decorative stitch not sewn by machine. B The common running-stitch, used in hand-seaming or, with longer stitches, in tacking. C The back-stitch, used for firm sewing, as in seams. D The common hemming-stitch. E The slip-stitch, used to make an invisible hem, a much more elegant hemming-stitch than D. F The overcasting stitch, used for rapid covering of a raw edge. G The herringbone stitch, or catch-stitch, which is used to join two raw edges brought together edge to edge, or a raw edge lapped over, as in a hem or the back of a coat collar. H The true buttonhole-stitch, showing properly cut buttonhole, with round hole at end made by a punch.

When you need a new thread, pull back the thread of the last stitch from the folded edge and insert the new thread as at first, and tuck under both the loose ends of thread and continue hemming as before.

HERRINGBONING—This stitch is used in place of hemming when the material is too thick to turn under twice as for an ordinary hem. Coat hems are often held in position by herringboning before a lining is adjusted. After turning the hem to the required position and tacking in place, commence the work from the left-hand end, make a knot in the thread, and put the needle through the fold, tucking the knot out of sight. Take the needle towards the right and, with the needle pointing left, pick up two or three threads below the raw edge and pull the thread through, then cross back a little to right and make a similar stitch above the raw edge, continue to make these stitches above and below the raw edge to the end of the hem, taking care that the stitches do not show through.

SLIP-STITCHING—This is similar to hemming, but the stitches are made a little further apart, and so lightly that they are practically invisible. It is used on dainty garments.

OVERSEWING—Oversewing is used for seams, the raw edges are both turned in an equal amount, and the two folds are placed together, with the raw edges facing one another. Commencing on the right, take the needle between the two folds and bring it through to the front at a few threads in depth, leave a short length of thread hanging, which should now be laid along the folded edges. Take the needle over behind the back fold and bring it through both folds at a few threads' depth, continue thus to end of seam, keeping stitches close together.

OVERCASTING—This is used to neaten the raw edges after a seam has been made, particularly when the material is likely to fray. The actual stitch is similar to oversewing, though the stitches should not be very close together or too tight. Sometimes the two raw edges are placed together, but often the single edges are oversewn after the seam has been pressed open.



BUTTONHOLES—Sometimes the buttons have pulled until they have torn through the buttonholing, and then it must be mended or there will be a bad tear through the edge of the garment. First, catch the torn place together carefully until it is as nearly the size of the old buttonhole as possible, and fasten securely. Then neatly buttonhole over the place that has been mended.

To make buttonholes, make running stitches all round the buttonhole about four or five threads in from the cut edge, then bring the needle through just below the running stitches and throw the thread over the needle towards your left hand (Fig 2). When you come to the outer end of the buttonhole make three or five stitches round it, throwing the thread the other way. This is called "blanket-stitching," and it makes a very strong edge.

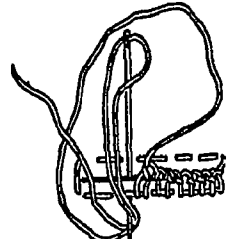


Fig 2—Making a Buttonhole.

DARNING—Use only two or three threads of the darning silk, or a single thread of darning wool. Silk is usually made of six threads, so you will have to divide it. Pull your darning thread just smooth, but not tight enough to pucker the material or the edges of the hole.

Place your darning egg, or mushroom, under the hole, but do not pull the stocking tight, only smooth, or you will stretch the hole larger. Thread your needle, but make no knot in the thread. Between the rows of darning stitches always leave a small loop of the thread, as some threads, especially woollen ones, tend to shrink and may cause puckering when washed. Start at the top of the hole (the edge nearest

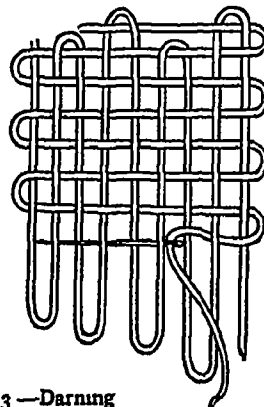


Fig 3—Darning

the top of the stocking), about half an inch from the edge of the hole (Fig 3). Take some small running stitches to the edge of the hole, bring the needle to the other side of the hole, and take running stitches here for half an inch. Do another row about one-eighth of an inch from the first one, and keep on until you have up and down threads across the hole and to about half

SEWING

an inch beyond Always make the lines of darning sufficiently close together to fill the hole

Start sewing in small running stitches across the first ones until you reach the hole Go over and under, under and over, these straight threads Make your rows close enough together so that they leave no empty spaces, and fill up the holes You must always take the running stitches well beyond the edge of the hole or the darn will be apt to tear away, as the cloth near the hole is usually thin and not strong

PATCHING—Sometimes you will have a hole to mend that is too big to darn, and you will have to patch it First cut all the rough edges and loose threads away Cut a piece of cloth to match the garment, at least twice as big as the hole Pin it under the hole, so that the pattern, if there is one, matches perfectly Turn under the edges of the cloth on the right side and tack down Put the patch on the wrong side, so that it is just big enough to cover all the thin part which is usually round a hole Fold under the edges of the patch and tack Now hem, with small stitches, the tacked edges on both sides of the stuff Pull out the tacking threads and press the patch If you want a very neat patch, cut the hole square before you start to patch it Then make a diagonal cut about a quarter of an inch deep at each corner, so that the edges will turn under evenly and lie flat

BUTTONS—When sewing on buttons thread your large needle with No 40 thread of the right colour Pull the ends of the thread together, so that the thread is double, and tie a knot Mark with a pin the place where the button is to go Start the needle by pushing it from the right to the wrong side Bring the needle through to the right side and put it through a hole in the button Put a pin across the top of the button and hold it with your left hand until you have taken enough stitches to hold it in place (Fig 4)

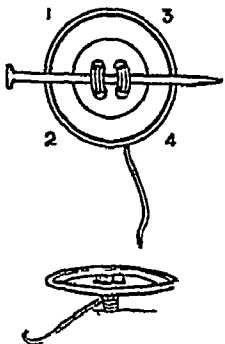


Fig 4—Sewing on buttons

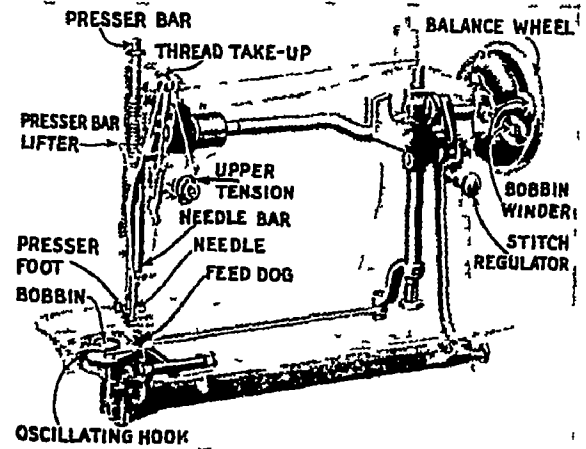
The needle should go up through the hole number 1 and down through 2, up through 1 and down through 2, for a button with two holes For a button with four holes, up at 1, down at 2, up at 3, and down at 4, then up at 1 again, and over and over the same way until the button is sewn tight Now pull out the pin and pull the button gently until the threads are tight Push the needle from the wrong side and bring it out *between* the cloth and the button ready for stemming, which is done by holding the button in your left hand and winding the thread tightly round the stitches three or four times

SEWING-MACHINE

Push the needle to the wrong side and fasten the thread, either by tying the two threads in a knot, or by making a few cross stitches

Sewing-machine. From the middle of the 18th century many inventors tried to make machines that would imitate the movements of the needlewoman's fingers One of the vital defects in the earlier inventions was that the cloth being worked had to be "fed" to the machine by hand

An Englishman named Thomas Saint is credited with having invented the first really workable sewing-machine That was in 1790,



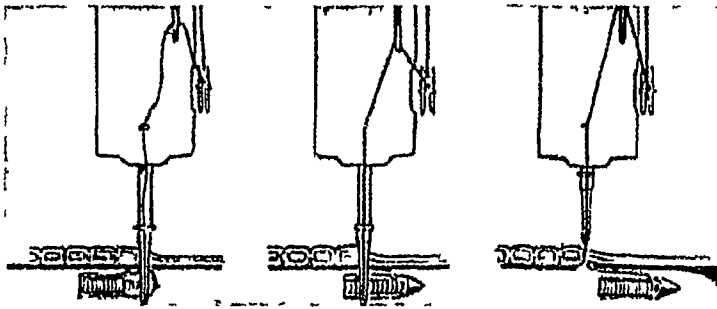
SECRETS OF A SEWING MACHINE

The motion of the bent shaft is changed by cams and levers into the up-and-down motion of the needle-bar, the to-and-fro motion of the feed dog, and the swinging of the oscillating hook. The take up tightens or loosens the thread, the stitch-regulator controls the length of the stitch.

and, whilst it was crude in its way it showed the possibilities that were to come later Another machine was patented by a Frenchman in 1830

By about the middle of the 19th century it had come to be realized that it was not necessary for the whole needle to go through the cloth for each stitch, and the machine needle with an eye near the point and the "lock-stitch"—such as are in use today—had appeared The lock stitch makes use of two threads The first thread, passing through the eye of the needle, is pushed down with the needle through the cloth, and forms a loop below The other thread, underneath the cloth, is carried through the loop by a shuttle, thus "locking" the stitch

Such a needle was used for the lock-stitch in a machine patented about 1846 by Elias Howe of Massachusetts, USA This sewing machine was equipped with a mechanical device for feeding the cloth, but the needle moved backwards and forwards horizontally, instead of vertically, as in our modern machines Howe and his machine were denounced by garment workers and tailors, who feared it



HOW A SHUTTLE MAKES A STITCH

The three pictures above show how the upper thread catches up the lower to make the famous "lock-stitch," the shuttle passing through the loop in the upper thread each time the needle comes down. As the needle rises, the take-up draws the thread taut, pulling the stitch up into place between the layers of material being sewn. Poor adjustment of the tension on the thread may cause the stitch to be improperly made, or the thread may even be broken or become entangled.

would deprive them of their means of livelihood. But gradually his machine came into use, and for about 25 years Howe collected royalties on every machine made.

About the same time John Bachelder devised the first machine combining the horizontal table with a continuous feeding device that would sew any length of seam. A leather belt set with steel points carried the material along.

But the greatest improvement of all was made by Allen B. Wilson, who in 1854 patented his celebrated "four motion feed," employed in practically all machines today. This device consists of a toothed metal plate which moves forward, carrying the cloth with it, then drops out of contact with the cloth, moves back, and rises to carry the cloth forward again.

Meanwhile I. M. Singer (1811-75), an American engineer, had invented the first "rigid arm" sewing machine, and had made important improvements in the shuttle. He finally obtained a patent after a long lawsuit with Howe. James Gibbs invented a "chain stitch" machine, later improved by J. Willcox. In this machine the loop of each stitch passes through and, by means of a hook, secures the loop of the previous stitch, something like the stitch in crocheting.

These early machines have been developed to such an amazing extent that today there are machines for sewing al-

most every article of clothing, up to holsters, embroidery, canvas, leather goods, etc., some of which run as fast as 4,000 stitches a minute. More than 600 kinds of machines are made by one company. In many industries specially designed machines are used for making buttonholes, and others for sewing on buttons. There are machines for faggoting, feather-stitching, pattern stitching, hemstitching, as well as smocking, ruffling, tucking, side and box pleating, tacking, and quilting. There are single and double needle machines, and those with four, six, and eight needles for glove work. Of these special machines the most important is

the shoe-sewing machine. (See Boots and Shoes). The household type has been improved and modified, chiefly in order to carry special attachments, until now the same machine can handle a great variety of work, including hem stitching, smocking, ruffling, tucking, side and box pleating, and quilting, all by using the lock-stitch.

Shackleton, Sir Ernest Henry (1874-1922). On March 3, 1903, a young man of 29 embarked for home on the ship *Morning* in the Antarctic region, somewhere about 77° south latitude. His companions, Captain Scott and Dr. Wilson, had returned to the *Discovery* just



SHACKLETON ON AN ICE RIDGE

During Shackleton's Antarctic expedition of 1914-15 his ship, the *Endurance*, was crushed to pieces by the pressure of ice and had to be abandoned. Beneath the ice the forces of Nature were in violent conflict and blocks of ice were forced up into ridges. Here Shackleton and Wild, his second-in-command, are seen on a heavy pressure ridge.

From "South" by Sir E. Shackleton. By permission of Messrs. Wm. Heinemann.

a month before, but Shackleton, after sharing all their hardships, had broken down on the way and had to wait for the relief ship to take him back.

Young Shackleton, however, amply made up for this disappointment. In 1908 he led an Antarctic expedition in the whaler *Nimrod*, made a dash for the Pole, reached 88° 23' S latitude on January 9, 1909, and planted the Union Jack on Mount Gauss, only 97 miles from the South Pole, the nearest point then reached. He was the first man to reach the south magnetic pole.

As a reward for his success the British Government contributed £20,000 to the costs of the expedition, and Shackleton was knighted. He commanded the Imperial Trans Antarctic expedition of 1914-17, drifted on an ice floe for 457 days, succeeded in making a voyage of 750 miles to South Georgia in a 22 ft boat, and returned to rescue all his men.

The *Quest*, the boat in which his last—the Shackleton-Rowett—expedition sailed in 1921, had been built specially for Arctic work. It was at the gate of the Antarctic, the island of South Georgia, that the explorer died of heart failure following influenza, on board the *Quest*. It had been intended to bring his body to England, but, having reached Montevideo, it was taken back and buried in South Georgia.

Shackleton, who was a native of Kilkee, in Ireland, wrote "The Heart of the Antarctic" (1909) and "South" (1919).

Shaftesbury, ANTHONY ASHLEY-COOPER, 7TH EARL OF (1801-1885) A fourteen year old Harrow schoolboy was walking down the famous Hill one day, when he heard the sound of revelry, apparently proceeding from a side street. To his amazement a party of men suddenly emerged into the high road, some of whom were carrying a coffin, which they were taking to the churchyard. All of them were intoxicated, and, as they sang and reeled along, one of them tripped and fell, and their burden was hurled into the road.

This horrible scene, so characteristic of the degradation which was widespread among the very poor little more than a century ago, made a most profound impression on the young schoolboy. Then it was that the future Lord

Shaftesbury resolved to do all in his power to improve the wretched lot of the more unfortunate of his fellow citizens.

Having early made his mark in Parliament as a social reformer, in 1828 he agitated for various reforms in the treatment of lunatics. In 1833 he turned his attention to mill workers, and was largely responsible for the earlier Factory Acts of 1833 and 1842, protecting children in factories and prohibiting underground labour for women and children, and also the famous "Ten Hours Act" of 1847, which reduced the hours of labour for women and children to ten a day. He also took a leading interest in the Ragged Schools and introduced legislation forbidding chimney cleaning by "climbing boys"—another of the shocking abuses of the time. Many kindred institutions likewise owe their existence to Shaftesbury, including the Shaftesbury Memorial Homes in London, and today the Shaftesbury Memorial (usually known as "Eros") in Piccadilly Circus and Shaftesbury Avenue recall the name and fame of a great man.

Previously known as Lord Ashley, he succeeded his father as Earl of Shaftesbury in 1851, and died on October 1, 1885.

Shag. This is one of our sea birds which at first sight you will probably mistake for a cormorant. But whereas the cormorant (*Phalacrocorax carbo*) is a large, long-winged, black-looking bird—its plumage has really a slight greenish or bluish metallic tinge—with a white patch on the throat below the beak, the shag (*P. graculus*) is dark all over, with more glossy plumage, and a little crest on top of its head. It is also smaller than the cormorant.

Both birds are common round most of our coasts, and in Japan and some other countries the local species are actually trained to catch fish. They are excellent divers, and swim well under water in pursuit of their prey, a ring fastened round the throat prevents them from swallowing the catch, and one bird may bring its master many fish in the course of a day's outing.

Shags and cormorants build bulky nests of seaweed high on the cliffs, the young, before they are able to fly and fish for themselves, feed by reaching down the parent's gullet and eating the half digested food. (See illus., page 518)



SHAFTESBURY—SOCIAL REFORMER

This portrait of Anthony Ashley Cooper, 7th Earl of Shaftesbury, is by the famous artist G. F. Watts. The Earl of Shaftesbury devoted his life to practical philanthropy and did much to bring about better conditions of labour. He took a keen interest in all institutions for poor children.

National Portrait Gallery

The GREATEST POET of THEM ALL

Not only England but the whole world looks to William Shakespeare as the greatest poetic genius mankind has ever produced, yet so little is known about the actual facts of his life, that we have to seek the man in his writings.

Shakespeare, WILLIAM (1564-1616) It is strange that although the people of his time loved and honoured Shakespeare as "Soule of the Age" (as his friend Ben Jonson put it), there is a very scanty amount of actual fact left to us on which to base an account of his life. Scholars have gone to great pains to unearth obscure documents which touch his life, and to trace the development of his mind and character from his plays and poems, but we still know so little about the external events of his life that some have even questioned whether he was the author of the works that bear his name.



The Bust in Stratford Church

William Shakespeare was born at Stratford-on-Avon (qv) near the end of April, 1564. The exact day is uncertain. His parents came of good country stock that had lived in Warwickshire for generations. His father dealt in agricultural products and was at one time a glover and at another a butcher. The poet's mother, Mary Arden, in spite of the fact that she came from a prosperous family, had no education, women in those days were seldom educated.

William was their third child. He was fortunate in living in Stratford, because the town had the unusual advantage of a free endowed grammar school, which, like other sons of "freemen"—members of the governing body of the town—the boy attended. It is there that Shakespeare learned what his scholarly friend, Ben Jonson, rather slightly calls "small Latine and lesse Greeke" French and Italian, with which he must have had some acquaintance, he probably acquired in London.

Wandering companies of players turned his thoughts early to the stage. The historic pageant given at Kenilworth

Castle for Queen Elizabeth by the Earl of Leicester must have aroused the boy's imagination, even if he did not see it himself. Then, too, Warwickshire is one of the most beautiful counties of England. His plays show that he loved Nature and that he knew the country folklore. Shakespeare's work shows plainly that he went through life with an open mind, and what did not come to him directly his imagination could supply.

No one has as yet entirely accounted for his leaving Stratford about 1586. Some say that the unhappiness of his married life led to his departure, for at 18 he had married Anne Hathaway, a young woman eight years older than himself. Others say that his father's failure in business laid heavier burdens on the son. Still others cling to the tradition that Shakespeare had got into difficulties by putting mocking verses on Sir Thomas Lucy's gate—Sir Thomas, as the story runs, had prosecuted him for deer-poaching in his park. No one knows the real reason for Shakespeare's departure, but it is a generally accepted fact that in his 21st year the young man left Stratford and walked to London by way of Oxford.

In 1592 Robert Greene, a playwright who was then on his deathbed, published an attack warning his friends to beware of Shakespeare and of others of his kind. "Trust them not," he says, "for there is an upstart crow beautified



Donn & McLeish

HERE SHAKESPEARE FIRST SAW THE LIGHT

Shakespeare's birthplace, in Henley Street, Stratford-on-Avon, was purchased in 1847 on behalf of the nation, and since 1891 it has been controlled by the Shakespeare Birthplace Trust, formed by Act of Parliament. The house, part of which is now a Shakespeare museum, has been restored as nearly as possible to its original appearance.



SHAKESPEARE HALED BEFORE A LOCAL MAGNATE FOR POACHING

Above we see Shakespeare before Sir Thomas Lucy, after the painting by Thomas Brooks. According to tradition, Shakespeare broke into Sir Thomas Lucy's game preserve and was caught deer-stealing. The youth was severely dealt with by Lucy, who is almost certainly ridiculed by the dramatist as the spiteful, mean-minded Justice Shallow.

with our feathers that with his Tyger's heart wrapped in a player's hide supposes he is as well able to bumbast out a blank verse as the best of you, and, being an absolute *Johannes Factotum* ('Jack of all Trades'), is in his own conceit the onely Shakescene in a countrie."

Soon after a friend of Greene's printed an apology for the attack, saying that Shakespeare was "excellent in the quality he professes." By his 28th year, then, it is plain that he was prominent enough in the theatre to have aroused both envy and admiration.

After all, there is a grain of truth in Greene's epithet "Jack of all Trades." On his arrival in London it is believed that Shakespeare earned his living as call boy or page in a theatre, but was soon promoted to small parts on the stage. His name came to be associated on playbills with those of Burbage, Kempe, and Condell, who were the best actors of the day. But Shakespeare never played leading characters. It was in such parts as that of the ghost in "Hamlet" and of Adam, the old man in "As You Like It," that he appeared at the Globe Theatre, perhaps sometimes before Queen Elizabeth herself. In pages 1313 and 1314 will be found illustrations of the drama as it was performed in

Shakespeare's day (See also illustration in page 1532).

Shakespeare soon learned that his bent was not for acting but playwriting—adapting old plays, imitating others, and writing dramas of his own for production in the theatre to whose companies he belonged. He took the blank verse which Greene and Marlowe had used before him and made it the most varied and flexible of English rhythms. He learned how to turn what had been a rather monotonous form into a delicate instrument on which he could play as he wished. Each play shows greater freedom than the one which preceded it—not only in verse music, but in construction and in the depths and power of the emotion expressed.

Several of the plays including all the great tragedies, are treated in this work under their titles. Here we shall only outline Shakespeare's development as a dramatist. He wrote about two plays a year, and with such apparent ease that the players in his company boasted that he never blotted a line. Roughly speaking, there are four periods in his career—which covered about 20 years—from 1591 to 1611.

In the beginning he experimented, for the plays of the early period are of all kinds. He

JEWELS FROM SHAKESPEARE'S TREASURE STORE

THE BEAUTIES OF NATURE

Night's candles are burned out, and jocund day
Stands tiptoe on the misty mountain tops

—*Romeo and Juliet, Act III, Scene 1*

But, look, the morn, in russet mantle clad,
Walks o'er the dew of yon high eastern hill

—*Hamlet, Act I, Scene 1*

How sweet the moonlight sleeps upon this bank!
Here will we sit and let the sounds of music
Creep in our ears Soft stillness and the night
Become the touches of sweet harmony
Sit, Jessica Look how the floor of heaven
Is thick inlaid with patines of bright gold
There's not the smallest orb which thou behold'st
But in his motion like an angel sings,
Still quiring to the young-ey'd cherubims,
Such harmony is in immortal souls,
But whilst this muddy vesture of decay
Doth grossly close it in, we cannot hear it

—*The Merchant of Venice, Act V, Scene 1*

THE POWER OF MUSIC

The man that hath no music in himself,
Nor is not moved with concord of sweet sounds,
Is fit for treasons, stratagems, and spoils
The motions of his spirit are dull as night
And his affections dark as Erebus
Let no such man be trusted

—*The Merchant of Venice, Act V, Scene 1*

If music be the food of love, play on!
Give me excess of it, that, surfeiting,
The appetite may sicken, and so die
That strain again! It had a dying fall
O, it came o'er my ear like the sweet sound
That breathes upon a bank of violets,
Stealing and giving odour

—*Twelfth Night, Act I, Scene 1*

VIEWS OF LIFE AND DEATH

Our revels now are ended These our actors,
As I foretold you, were all spirits, and
Are melted into air, into thin air,
And, like the baseless fabric of this vision,
The cloud-capp'd towers, the gorgeous palaces,
The solemn temples, the great globe itself,
Yea, all which it inherit, shall dissolve
And, like this insubstantial pageant faded,
Leave not a rack behind We are such stuff
As dreams are made on, and our little life
Is rounded with a sleep

—*The Tempest, Act IV, Scene 1*

Cowards die many times before their deaths,
The valiant never taste of death but once
Of all the wonders that I yet have heard,
It seems to me most strange that men should fear,
Seeing that death, a necessary end,
Will come when it will come

—*Julius Caesar, Act II, Scene 11*

To-morrow, and to-morrow, and to-morrow,
Creeps in this petty pace from day to day
To the last syllable of recorded time,
And all our yesterdays have lighted fools
The way to dusty death Out, out, brief candle!

Life's but a walking shadow, a poor player
That struts and frets his hour upon the stage
And then is heard no more It is a tale
Told by an idiot, full of sound and fury,
Signifying nothing

—*Macbeth, Act V, Scene 5*

O, that this too too solid flesh would melt,
Thaw, and resolve itself into a dew!
Or that the Everlasting had not fixed
His canon 'gainst self-slaughter! O God! God!
How weary, stale, flat, and unprofitable,
Seems to me all the uses of this world!
Fie on't! ah fie! 'Tis an unweeded garden,
That grows to seed, things rank and gross in
nature

Possess it merely

—*Hamlet, Act I, Scene 11*

THE LESSONS OF PHILOSOPHY

Sweet are the uses of adversity,
Which, like the toad, ugly and venomous,
Wears yet a precious jewel in his head,
And thus our life, exempt from public haunt,
Finds tongues in trees, books in the running
brooks,

Sermons in stones, and good in every thing

—*As You Like It, Act II, Scene 1*

The fool doth think he is wise, but the wise man
knows himself to be a fool

—*As You Like It, Act V, Scene 1*

Some are born great, some achieve greatness,
and some have greatness thrust upon 'em

—*Twelfth Night, Act II, Scene 5*

THE SEVEN STAGES OF LIFE

All the world's a stage,
And all the men and women merely players
They have their exits and their entrances,
And one man in his time plays many parts,
His acts being seven ages At first the infant,
Mewling and puking in the nurse's arms
And then the whining school-boy, with his satchel
And shining morning face, creeping like snail
Unwillingly to school And then the lover,
Sighing like furnace, with a woeful ballad
Made to his mistress' eyebrow Then a soldier,
Full of strange oaths, and bearded like the pard,
Jealous in honour, sudden and quick in quarrel,
Seeking the bubble reputation
Even in the cannon's mouth And then the jus-
tice,

In fair round belly with good capon lin'd,
With eyes severe and beard of formal cut,
Full of wise saws and modern instances,
And so he plays his part The sixth age shifts
Into the lean and slipper'd pantaloon,
With spectacles on nose and pouch on side,
His youthful hose, well sav'd, a world too wide
For his shrunk shank, and his big manly voice,
Turning again toward childish treble, pipes
And whistles in his sound Last scene of all,
That ends this strange eventful history,
Is second childishness and mere oblivion,
Sans teeth, sans eyes, sans taste, sans everything

—*As You Like It, Act II, Scene 7*

FAMOUS SCENES FROM SHAKESPEARE'S PLAYS



KING LEAR WITH CORDELIA DEAD IN HIS ARMS

LEAR *Howl, howl, howl howl! O
you are men of stones,
Had I your tongues and eyes, I'd use
them so
That heaven's vault should crack.
She's gone for ever!
I know when one is dead, and when
one lives,
She's dead as earth*

*This feather stirs, she lives! if it
be so,
It is a chance which does redeem all
sorrows
That ever I have felt*

*A plague upon you, murderers, trar-
tors all!
I might have saved her now she's
gone for ever!
Cordelia, Cordelia, stay a little Ha!
What is't thou say'st? Her voice was
ever soft,
Gentle, and low, an excellent thing in
woman*

KING LEAR, Act V, Scene iii

MACBETH AND LADY MACBETH

LADY MACBETH *Why did you
bring these daggers from the place?
They must lie there go carry them,
and smear
The sleepy grooms with blood*

MACBETH *I'll go no more
I am afraid to think what I have
done,
Look on't again I dare not*

LADY MACBETH *Infirm of pur-
pose!
Give me the daggers the sleeping
and the dead
Are but as pictures 'tis the eye of
childhood
That fears a painted devil
If he do bleed,
I'll gild the faces of the grooms
withal
For it must seem their guilt*
MACBETH Act II, Scene ii



SHYLOCK AFTER HIS DAUGHTER'S FLIGHT



SALANIO I never heard a passion so confused,
So strange, outrageous, and so variable,
As the dog Jew did utter in the streets
'My daughter! O my ducats! O my daughter!
Fled with a Christian! O my Christian ducats!
Justice! the law! my ducats, and my daughter!
A sealed bag, two sealed bags of ducats,
Of double ducats, stolen from me by my daughter!

And jewels, two stones, two rich and precious
stones,
Stolen by my daughter! Justice! find the girl,
She hath the stones upon her, and the ducats!
SALARINO Why, all the boys in Venice follow
him,
Crying, his stones, his daughter, and his ducats
THE MERCHANT OF VENICE, Act II, Scene viii

THE SONG OF AUTOLYCUS, THE MERRY PEDLAR



Lawn as white as driven snow,
Cyprus black as e'er was crow,
Gloves as sweet as damask roses,
Masks for faces and for noses,
Bugle bracclet, necklace amber,

Perfume for a lady's chamber,
Golden quoifs and stomachers,
For my lads to gve their dears
Pins and poking-sticks of steel,
What maids lack from head to heel

Come buy of me, come, come buy,
come buy,
Buy, lads, or else your lasses cry
Come buy
THE WINTER'S TALE, Act IV, Scene iv

SHAKESPEARE



'TO SWEET BEDS OF FLOWERS'

In 1597 Shakespeare purchased a large house in Stratford-upon-Avon. Behind it is this lovely garden, where "rare" Ben Jonson and Michael Drayton were wont to forgather with their friend and fellow-poet. New Place Museum now adjoins all that remains of the poet's house.

plays become sombre in tone and deeply philosophic. The flowing style which carried the comedies and most of the histories along so trippingly is gone, and is replaced by a difficult and sometimes even obscure utterance, as though the writer were carried away by forebodings of evil. "Hamlet" and "Macbeth" require many readings and much thought to understand them. "King Lear" calls on all the elements of air and sky as a fit setting for the disappointed passion of the old mad king. In "Othello" the passion of jealousy inspires a tragedy strong in form and masterly in dialogue and description. Terrible as these plays are in theme and plot, they are so permeated by Shakespeare's deep understanding of human nature and real power as a poet, that they stand supreme among his works.

The last period of Shakespeare's career began after 1609. In it are found the plays which combine the wisdom of the Hamlet epoch with a more genial outlook on life. "The Tempest," "Cymbeline," and "The Winter's Tale" show the serenity which so often colours the more mature years of a great man's life. Although there are sorrows and misunderstandings in these later plays, all the perplexities are finally

imitated the brutality of Marlowe in "Titus Andronicus." In "Love's Labour's Lost" he balanced phrase against phrase after the fashion of Lyly. He dramatized a romance in "Two Gentlemen of Verona," and probably adapted and transformed many other plays which have been lost. "Romeo and Juliet," probably written in 1592, is the first play which shows promise of his full powers. The plot was not his own, nor were all the characters, but he put into it so much ardour and beauty that what he borrowed he made his own.

The plays of his middle years consist largely of histories and comedies. England was eager to see her glorious and eventful story on the stage, so Shakespeare constructed a series of plays from Holinshed's "Chronicles of England, Scotland, and Ireland" (1577). "Henry IV" in its two parts is the best of these. To this period belong Falstaff, his greatest comedy figure, and the whole-souled women who delight us with their wit and laughter. Portia, Beatrice, and Viola are among the loveliest of his characters.

After 1600 Shakespeare seems to have passed into a mood of solemn questioning of life and death. His



SHAKESPEARE COURTING ANNE HATHAWAY

So passionately was Shakespeare in love with Mistress Anne Hathaway, who lived at Shottery, near Stratford, that they were married before he was nineteen. She was eight years older than her husband.

SHAKESPEARE

smoothed out and all the endings are happy. The style, too, is easier and flows more evenly. Shakespeare's activities as an actor, as part owner of several theatres, as a playwright and poet made him a moderately rich man. He returned to Stratford to live, and bought one of the biggest houses in the town, New Place, round the corner from his birthplace. He probably divided his last six years between Stratford and London. At his death he was only 52 years old.

Texts and Dates of the Plays

It is unfortunate for us that Shakespeare did not supervise the printing of his plays, but in his day it was thought to be to the interest of the theatre to keep plays in manuscript, so that people had to come to the playhouse if they wished to become acquainted with a writer's dramas. The result was that texts of only 16 of Shakespeare's plays were printed before 1623. Some of the 16 were duly registered according to law (copyrighted), and then printed, while others were taken down in shorthand in the theatre and printed without permission. The latter copies were very faulty.

Various editions of the plays were printed after Shakespeare's death, but it was not until 1623 that a complete edition (the First Folio edition) was put forth, based in part on 20 hitherto unpublished plays furnished by John Heminge and Henry Condell, actors of Shakespeare's company. The edition was a success, and another one was printed nine years later.

Besides his plays, Shakespeare composed over 150 sonnets—short rhymed poems of 14 lines each—which remain amongst the noblest lyrics in the language. He wrote also several longer non-dramatic poems, which he dedicated to Henry Wriothesley, the third Earl of Southampton, his friend and patron.

The Secret of Shakespeare's Appeal

What is it that makes Shakespeare endure as the supreme dramatist of the world? We may answer that he combines all the qualities that make literature enduring. He combines wisdom to understand and charity to forgive human frailties. He has the power of making humanity real. Gaiety, light-heartedness, laughter, pity, tears, passion, are all his. His work has the ease and careless grace of all masterpieces, and, above all, it is charming to the ear. As Ben Jonson truly said, "He was not of an age, but for all time."

Excellent modern plays dealing with Shakespeare's life are Clemence Dane's "Will Shakespeare" and Charles Williams's "A Myth of Shakespeare," and the poet also appears in Bernard Shaw's "Dark Lady of the Sonnets."

Although there is considerable difference of opinion as to the dates of some of Shakespeare's works, most critics agree in general to this arrangement by Sir Sidney Lee.

SHAMROCK

1 Period of Early Experiment

Love's Labour's Lost	1591	*Henry VI (three parts)	1592
Two Gentlemen of Verona	1591	Richard III	1593
The Comedy of Errors	1592	Richard II	1593
Romeo and Juliet	1592	*Titus Andronicus	1594
		Merchant of Venice	1594
		King John	1594

2 Period of Development

A Midsummer Night's Dream	1594-5	Henry IV (two parts)	1597
All's Well that Ends Well	1595	The Merry Wives of Windsor	1597
Taming of the Shrew	1595	Henry V	1598

3 Period of Maturity

Much Ado about Nothing	1599	Julius Caesar	1601
As You Like It	1599	Hamlet	1602
Twelfth Night	1600	Troilus and Cressida	1603

4 The Highest Themes of Tragedy

Othello	1604	*Timon of Athens	1608
Measure for Measure	1604	*Pericles	1608
Macbeth	1606	Antony and Cleopatra	1608
King Lear	1607	Coriolanus	1609

5 Period of Serenity

Cymbeline	1610	The Tempest	1611
The Winter's Tale	1611	*Henry VIII	1612

*Plays of which Shakespeare was only part author.

Shamrock. "You tell us that there are three gods, and yet one," wonderingly said the natives of Ireland when St. Patrick was preaching the gospel some 1,500 years ago.



For Photos

'DEAR LITTLE SHAMROCK'

Every year, on St. Patrick's Day, March 17, shamrock is presented by the officer commanding the regiment to all ranks of the Irish Guards. On this occasion there was evidently some left over, to the great delight of this little kiddie.



A FAMOUS STREET OF THE EAST—THE BUND AT SHANGHAI

Above is a view of the Bund, the waterfront of the International Settlement at Shanghai, the great treaty port. Looking northward from the boundary of the French Concession, we see some of the most imposing buildings of the Settlement, including the Hong Kong and Shanghai Bank and the Customs House. Shanghai was occupied by Japanese troops during the Sino-Japanese conflict in 1937, except for the International Settlement.

For answer the saint bent down and plucked some shamrock growing at his feet. "Do you not see," he said, "how in this wild flower three leaves are united on one stalk, and will you not then believe what I tell you, that there are indeed three persons and yet one God?"

Historians have relegated many stories about St. Patrick to the realm of myth, but the shamrock remains the emblem of Ireland, proudly worn by Irishmen the world over on St. Patrick's Day, March 17. The true shamrock (in Irish *seamrog*, meaning "three leaved") is the hop trefol (*Trifolium minus*). Its flowers are yellow and its leaflets blue green. Large shipments of shamrocks are sent all over the world for St. Patrick's Day.

Several other three leaved plants are loosely called shamrock, including the white clover (*q v*) and the wood sorrel. The latter is a species of *Oxalis* and is no relation of the clovers at all. It grows in oak woods and has white flowers delicately veined with purple.

Shanghai, (Pron shang hi'), CHINA. Nowhere in the world is there another city like Shanghai. In the streets of this twin city—for it is two cities, one European and one Chinese—the East and the West jostle each

other, and, although they live side by side, each knows little of the other's doings. The European city, in which dwell merchants, missionaries, and adventurers from all the countries of the world, is clean and handsome, with splendid shops and houses, broad streets, and huge office buildings. Nearly a million Chinese have thronged into the foreign concessions, to enjoy the advantages of foreign laws and administration. The International Settlement is governed by an international council and protected by international police.

The native district between the International Settlement and the river Yangtze was badly wrecked, particularly the Chapei section, and captured by the Japanese early in 1932, following a boycott against Japanese goods instituted by the Chinese in retaliation for Japanese military operations in Manchuria. In spite of repeated protests, the Settlement, like the rest of Shanghai, was severely bombarded during the Chinese Japanese conflict which broke out in 1937. Chinese refugees poured into the Settlement in their thousands.

On the southern side of the International Settlement, in a sort of pocket in the French Concession, is the "Chinese city" of Shanghai,

squalid, with narrow, dingy streets. On Shanghai's wide waterfront, the Bund, which runs along the river Hwangpu from the French Settlement to the Soochow Creek, European taxi-cabs line up for fares beside Mongolian ponies, Chinese rickshaws, and wheelbarrows.

In the Chinese Quarters

Foochow Road in the central district is considered by the Chinese one of the most imposing thoroughfares in the whole country. It is lined with gorgeous shops and restaurants, which are so brilliantly lighted at night that the Chinese call it their "Great White Way." Of special interest in the Chinese City is the quaint old Willow Tea House, supposed to have furnished the design for willow-pattern china.

The great productiveness of the country around Shanghai and its strategic position near the mouth of China's greatest river, make it one of the most important seaports in the Far East. Railways lead inland from Shanghai, and 40 miles away is the Grand Canal, China's great waterway between north and south. By these routes come for export a vast amount of tea, rice, cotton, wool, beans, wheat, silk, and hides. Chief among the imports are cotton, yarns, and cloth, coal, sugar, metals, machinery, and oil. In normal times Shanghai has a larger commerce than any other Chinese port. By November, 1937, the whole of Shanghai had been occupied by the Japanese. Shanghai's population is about 3,500,000 (including neighbouring districts).

Shantung, (Pron shan-tung'), CHINA. On the east coast of China, looking across the Yellow Sea to Korea and Japan, lies Shantung—a mountainous promontory 55,984 square miles

in area, reaching out from the alluvial plains built of the silt brought down by the treacherous Hwang-ho or Yellow River. Into this province are crowded 34,000,000 Chinese; it is one of the most densely populated districts in the world. It is the land of "shantung" and of "pongee" silk, made from the wild silkworm cocoons. Silk, coal, and iron, and the "coolie" labourer constitute its chief sources of wealth.

In 1897-1898 Germany exacted a concession of territory in Shantung—the bay of Kiaochow and fishing village of Tsingtao—as a penalty for the killing of two German missionaries. Shortly after, Weihaiwei, on the north coast of the promontory, was leased to Britain, but was restored in 1930.

Tsingtao became a great port and military and commercial centre, and the whole province came largely under German economic control. Other cities were modernized, including Tsinan, the capital, and railways were built with German capital to connect them.

Japanese in Control

In payment for her capture of Kiaochow during the World War, Japan demanded of China, and was given by the Peace of Versailles, the German economic concessions in Shantung—i.e., railways, mines of all sorts, submarine cables, etc. The Chinese protested bitterly, and fighting occurred in 1928-29. The Japanese gave a promise that all political rights in the provinces should revert to China. This was fulfilled, but the Sino Japanese War of 1937-8 restored to Japan control of the province.

Tsinan was captured on December 28, 1937, by the Japanese, who then advanced southwards, taking the port of Tsingtao without resistance on January 10, 1938. The mining operations, begun by Germany and continued by Japan, are still in the early stages of development, but the presence of coal and iron, together with plentiful cheap labour, give promise that Shantung will become one of the chief iron and steel centres of eastern Asia.

Chefoo, on the north coast of the peninsula, is of steadily increasing commercial importance. Most of Shantung's silk, both raw and manufactured, is exported through this port.

Sharks. These fish are well named "tigers of the sea," for they are among the most voracious of all creatures, devouring anything that comes their way. With their near relatives the rays they are set



THE DOG-FISH—A MINIATURE SHARK

Berridge

The dog-fish is just a small edition of the shark, and here is his face, as evil in appearance as you could wish. The mouth, you see, is on the underside, and these fish have to turn on one side, or even right on to their backs, to seize their prey. Dog-fish such as this are caught in large numbers off our shores.

SHARK

apart in a group of fishes called *Selachians*, the mark of which is that in them the skeleton is not bony, as in most other fishes, but formed of cartilage. Another notable difference between these and the bony fishes is that in sharks the skin is filled with minute bony particles, whose crowded points come through and stud the surface like fine sandpaper. This skin makes the leather called "shagreen," used as a polisher and for covering cigarette cases and similar objects.

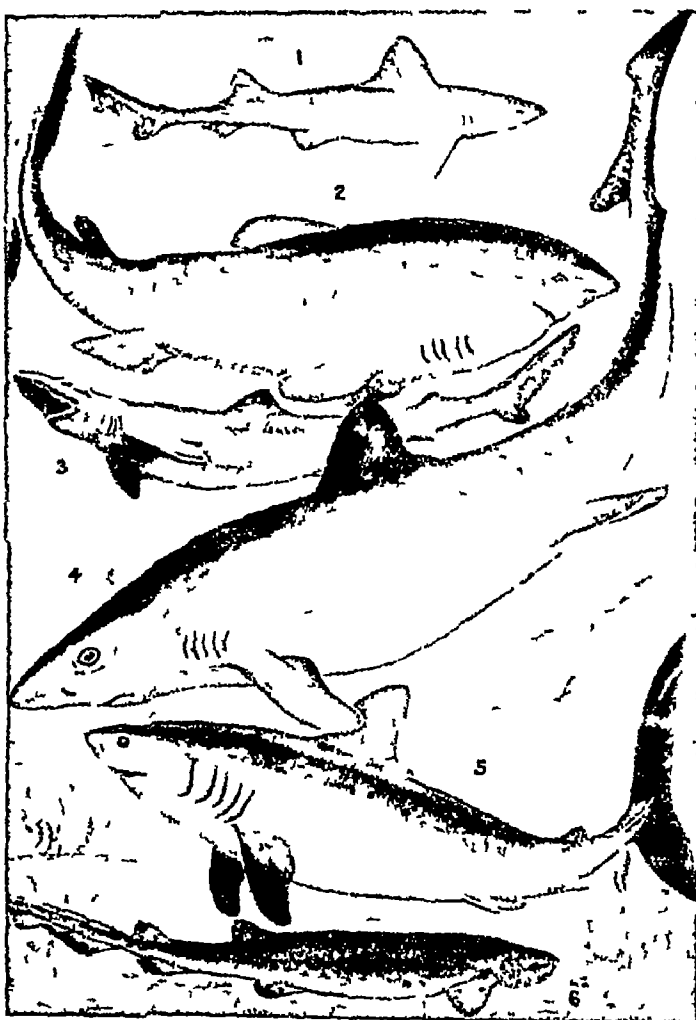
Some sharks, such as the various species of dog fish, are comparatively small, while others attain a length of 40 feet and in rare instances 60 feet, some extinct species were even more gigantic. All are more numerous in warm than cold seas, many species belonging wholly to the tropics.

Horrid Jaws of the Sharks

The great majority of sharks are surface hunters and swift and powerful swimmers. The mouth, which is usually on the underside of the head, is large and furnished either with separate, thin, sharp-pointed cutting teeth, often notched along the edge, or else with blunt teeth massed into a crushing surface. Muscles of enormous strength work these horrid jaws. The position of the mouth compels the shark to turn on its back and seize its victim from beneath.

Judged by habits, sharks are of two sorts. "Ground sharks" seek their food close to the bottom, but not in very deep water, the other kind remains near the surface. The former are blunt headed, sluggish, and harmless to man. Their mouths are lined with hard, rounded blocks called "pavement teeth." This class is the fewest in number and most ancient in character of all the *Selachians*.

Of the various kinds of sharks, one big slender fellow, the "hammer head" (*Zygaena malleus*), has his head so broadened by two big side lobes that it resembles the head of a hammer. The eyes are in the ends of these lobes, but the mouth is in the usual position. Another, the fox shark or "thresher" (*Alopias vulpes*), has the upper lobe of its tail very long. This it lashes to and fro in order to stun or terrify herring or mackerel shoals into inactivity, when it can eat them in peace! The great white shark (*Carcharodon*) is the most dangerous of the man-eating species and the largest, some man-eaters, however, are comparatively small, nine or ten feet in length. It would seem that deaths attributed to attacks "by sharks" are in most cases due to cramp, which causes a swimmer at times suddenly to double up and



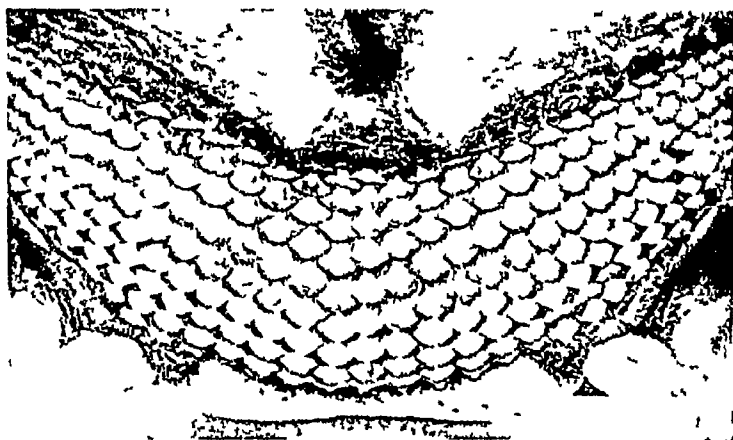
SHARK AND DOG FISH TYPES

These fish are typical representatives of the group which includes the sharks and dog-fishes. They are 1, smooth hound, 2, Greenland shark, 3, tope, 4, white shark, 5, porbeagle, 6, nursehound. They vary in size from 20 feet in the white shark to 4 or 5 feet in the "hounds" and the tope. The latter are classed as dog fishes.

disappear. In America, sharks have attacked bathers, however. Our own fiercest common species are the blue shark (*Carcharias glaucus*), which may be 25 feet long, and the porbeagle (*Lamna cornubica*), less frequently caught and often ten feet in length.

A Monster British Shark

But considerably larger than any of these sharks is the great basking shark (*Selache maxima*), which, curiously enough, is hardly carnivorous, living apparently on plankton. It is found off the west coast of Scotland and Ireland, and gets its name from the habit of basking in the sun on the surface. It has recently been much publicized owing to the damage it does to herring nets, and many of these creatures have been harpooned and other wise destroyed during the summer months. There was at one time a regular fishery for them off the Irish coast, on account of the oil which



THE NURSE SHARK'S TERRIBLE TEETH

How would you care to have nine rows of sharp teeth like these? They are the equipment of the nurse shark's lower jaw, and are really nothing exceptional among the members of the shark family. Nearly all of them have teeth of this type, enabling them to eat a great deal of food very quickly.

American Museum of Natural History

is contained in large quantities in the huge liver. Many of the smaller members of this family, such as the tope (*Galeus vulgaris*), and the various dog-fish which are fished for by anglers in the Channel and North Sea, reach the market under various names, usually as "rock salmon" or "Darwen salmon," and are eaten by people all over England. Other sharks are hunted for their skins, while in China their fins are considered a great delicacy.

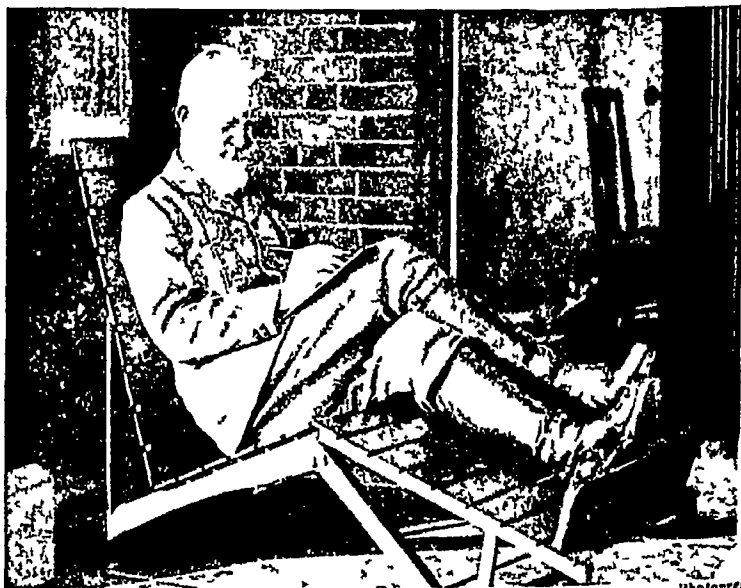
Some of the sharks are viviparous, producing their young alive, several at a time, but others lay eggs which are enclosed in curious cases, brownish leathery objects from whose four corners extend tendrils by which the eggs are attached to weeds. You may perhaps find these cases washed up on the beach, split at one end through which the young shark has escaped.

Shaw, GEORGE BERNARD (born 1856). Probably no man has ever been so much discussed during his lifetime as Bernard Shaw. For over fifty years he has been saying brilliant and provocative things, either from the platform, in the newspaper or through the medium of the theatre. His personal peculiarities are known, he is a vegetarian, a non-smoker, and a teetotaler, and he writes his plays in shorthand, mostly on the tops of buses or in the tram. Many people chuckle disdainfully at what is called the "Shavian" wit and philosophy, yet realize that behind the twinkling eyes and long white beard is one of the greatest intellects of the age.

George Bernard Shaw was born in Dublin on July 26, 1856, the only son of a retired law courts official. After five years in a Dublin office, utterly dissatisfied, he went, in 1876, to London. Largely supported by his mother, he gave himself up to literary activities, living desperately poor and with his work unrewarded. During the first nine years of his life in London he earned only £6 with his pen. He produced five novels between 1879 and 1883, but no publisher would accept them. Inspired in 1882 by a lecture given by the American, Henry George, Shaw became an ardent Socialist, and soon won the friendship of, amongst others, the Webbs, William Morris and Mrs. Annie Besant. He became a member of the Fabian Society on its formation in 1884.

It was as a music and dramatic critic in the 'nineties that Shaw first made the initials G. B. S. famous. In the former capacity he caused a stir with his book, "The Perfect Wagnerite" (1898), and he had already won recognition for his championship of Ibsen in "The Quintessence of Ibsenism" (1891).

Meanwhile he had found time to continue his own education with unabated vigour. He never failed to deliver at least one speech in public a week. His studies were equally various and equally energetic. It was as much on the sound knowledge of his subjects which he acquired during these industrious years as on his wit and his humour that he was able to win success as a dramatist. Shaw had finished



Photopress

G. B. SHAW, THE PROVOCATIVE WIT

George Bernard Shaw has made the drama the principal medium of his messages to the world, but apart from his dramatic work he has also written a number of highly provocative books. Sincere and earnest, he nevertheless imparts to even his most drastic utterances a wit and sardonic humour which has come to be associated with the man, and has given rise to the adjective "Shavian."

SHAW

his first play in 1892. But small success had attended the performances of his earlier plays, and he had begun to publish them in book form. However, the issue in 1898 of "Plays Pleasant and Unpleasant," containing, amongst other pieces, "Arms and the Man," "Candida," and "You Never Can Tell," attracted a wide reading public, and his name became associated with the most violent discussions of the day. Thenceforth he made the drama the real medium of his message: elaborate prefaces to the published editions of his plays dealing wittily, eloquently, and provocatively with all questions and movements from marriage to militarism, from spelling reform to God.

Few writers have preserved the strength and elasticity of their mental powers so far into life as Shaw has done. His post War plays include "Back to Methuselah" (1921), a colossal drama of ideas, embodying a complete exposition of his philosophy, and "Saint Joan" (1923), which is in many respects his highest achievement as pure drama presented ideally and yet in a manner comprehensible to all.

Other notable plays are "Man and Superman" (1903), "John Bull's Other Island" (1907), "The Doctor's Dilemma" (1911), "Androcles and the Lion" and "Pygmalion" (1916), "Heartbreak House" (1919), "The Apple Cart" (1929) and "Too True to be Good" (1932). Many of these are presented at the annual Malvern Festival, which has several times seen the first performance of a new Shaw play.

Apart from his dramatic work, Shaw also produced a number of highly provocative books, including "The Intelligent Woman's Guide to Socialism and Capitalism" (1928) and "The Adventures of a Black Girl in Search of God" (1932). He was awarded the Nobel Prize for Literature in 1925, and gave the money to the Anglo-Swedish Foundation.

Sheep. You often speak of people following one another "like so many sheep," and indeed these are among the most stupid of animals, yet few creatures are more useful to Man, and many primitive peoples would find it very hard to exist without them.

In the wild state sheep are found only in mountainous regions, often at great heights, never in lowlands. They are closely related to goats, which some wild types resemble.

Sheep live in flocks and follow a leader, usually an old ram, as the male is called. They are very timid and flee at the approach of danger, but when pressed they can fight, defending themselves against predacious animals. Ewes, as the females are called, will frequently pluck up courage and charge dogs that threaten their lambs.

The lambs are born singly or in pairs at birth, usually in the spring but sometimes in winter, and soon can follow the mother about. The shepherd, however, has many anxious moments if the weather is severe.

The moufflon (*Ovis montanus*), the only representative of the sheep family native to Europe, is found on the islands of Corsica and Sardinia. The udd (*O. lervia*), or Barbary sheep, is found in northern Africa, in the Atlas Mountains. It is a large animal, resembling the goat, and has large horns and a mane-like growth of long hair on the breast and forelegs. The Tibetan argali (*O. ammon*), whose enormous spreading horns are a wonder to all beholders, and the Marco Polo's sheep (*O. poli*), whose horns are



H. D. Herridge

EUROPE'S ONLY NATIVE SHEEP

This fine creature is the moufflon, a wild member of the sheep family found in Corsica and Sardinia. The individual shown is a ram in his winter coat; in summer he has less thick wool. The moufflon is also found wild in Central Asia.

even longer, are the largest members of the sheep family. The latter gets its name from the traveller who first described it. The big-horn, or Rocky Mountain sheep (*O. canadensis*), is the chief North American species.

The fat-tailed sheep, found in many parts of Africa and Asia, is remarkable for the quantity of fat which accumulates in its tail, in some instances the tail weighs from 50 to 80 lb. The fat is highly esteemed as a delicacy and is often used instead of butter. The new-born lambs of other Asiatic sheep, such as the Astrakhans and Karakul breeds, have a very fine wool twisted in spiral curls, which is in high demand for clothing, though very expensive.

The origin of the domestic sheep (*O. aries*) is unknown. It is noteworthy that they bear little resemblance to any of the existing wild species. For example, many of the domestic breeds are hornless, though some have developed four

SHEEP

horns Nearly all bear wool instead of the coarse hair of the wild sheep

Famous among the domestic breeds is the Merino, which originated in Spain in the 15th century It produces a huge quantity of fine-quality wool, and has been used to improve most other European short-wool breeds

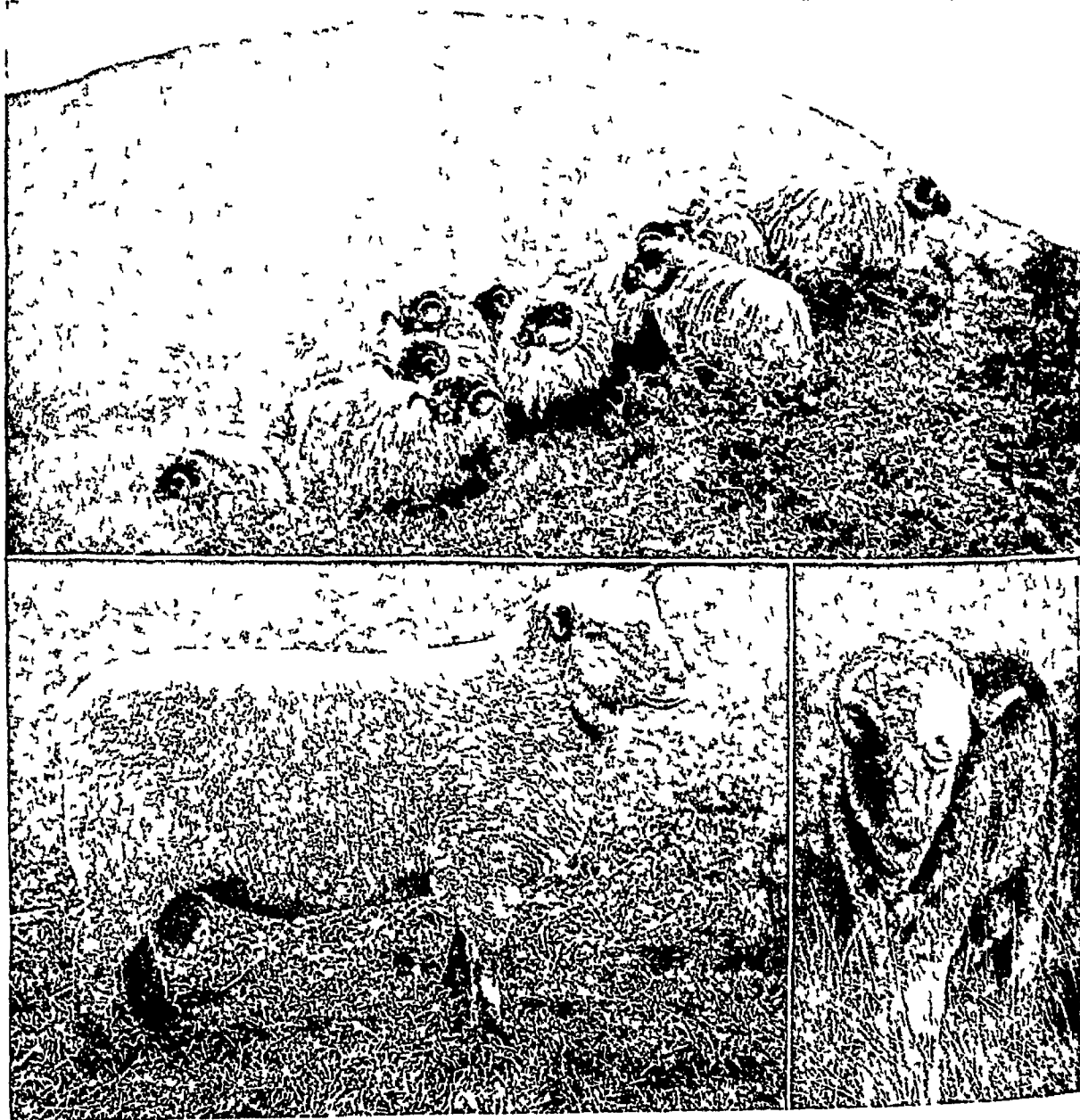
British breeds of sheep are conveniently classed as long-wool, short-wool and mountain breeds Of the long-wool breeds well-known examples are the very ancient Cotswold breed, with a large hanging tuft of wool on the forehead, the Leicester, which came into prominence in the 18th century through the improvements of Robert Bakewell, the hardy Romney

Marsh or Kent sheep, the Lincoln, also with a forehead tuft, and the Wensleydale

The short-wool breeds include the graceful Southdown, and Shropshire Down, noted for their excellent mutton, the Roman nosed Hampshire Down, the black-faced Suffolk Down and the Dorset Horn, in which both rams and ewes have horns

Among mountain breeds are the handsome Cheviots of the Scottish hills, the very hardy Scottish Blackface, the Exmoor (horned) and Dartmoor (hornless), and the small Welsh mountain breed famous for mutton

Sheep are raised all over the world, especially in Australia, New Zealand, Argentina,



THEIR ANCESTORS WERE NIMBLE CREATURES OF THE WILD

Like clay in the hands of the potter, the wiry, agile, graceful wild sheep has been moulded to suit human convenience—into the many woolly, short-legged, clumsy breeds of domestic sheep Top, is a group of Scottish blackface sheep, which make excellent mutton but produce an inferior grade of long, coarse, hairy wool Below, to the left, is the aristocratic pure-bred Sussex or Southdown, with its fine short fleece On the right is a Merino ram The Merinos are not good mutton-producers, but are considered the greatest wool-producing breed in the world.



SHEEP AND SHEPHERD

In the lovely photograph above we see sheep on their way to a dipping station in the Berwyn Mountains, Denbighshire. On the right is an old shepherd, Bob Farris by name, who has been attending to sheep for close on seventy years. Tucked under his arms are two Hampshire Down lambs.

Photos: top Fox Photos; bottom, Keystone.

the British Isles, the U.S.A., and Uruguay. To those who only know sheep farming as it is carried on in England, the farms of some of the great sheep raising countries of the world would be a revelation. In Australia, for instance, the sheep "stations," as they are called, are on a vast scale, many of them being as much as 100,000 acres. (See pages 354, 359 and 2965)

A large part of Australia is natural pasture, and the climate and vegetation are exactly suited to the production of wool and mutton of the finest quality. The world production of wool is estimated to be 1,550,000 tons, of which Australia furnishes nearly one quarter. Next in order of production come the Argentine and Uruguay. (See also Wool)

Sheffield. All over the world "Sheffield" stands for fine cutlery, such as knives, razors, scissors, surgical instruments, together with mathematical instruments, files, saws, and engineering tools of all kinds. Heavy steel, too, is



manufactured there—armour plate, rails, engines, machinery, guns and shells—and cast-iron articles, such as stoves and grates, as well as silver, chromium, and brass ware

Next to the Lord Mayor, the highest dignitary in the city is the Master Cutler of the ancient Cutlers' Company, which exercises jurisdiction over the metal industries in the district of the West Riding of Yorkshire, in which Sheffield is situated. The famous "Sheffield plate" (silver) is no longer manufactured, the process was abandoned in 1850 in favour of electro-plating.

Sheffield's pre-eminence in the steel industry is due in part to its situation in the Yorkshire-Derbyshire coal-field. Yet iron was smelted with charcoal in the district probably in Roman times—certainly by the time of the Norman Conquest—and Sheffield blades were famous long before "pit coal" was used in the manufacture of iron and steel.

It was a Sheffield man, Benjamin Huntsman, who in 1740 introduced the process of making crucible steel from bar or blister steel, which is still used in making fine Sheffield cutlery. Henry Bessemer established his first steel works in Sheffield, and much Bessemer steel is still manufactured there.

Like most other steel towns, Sheffield is smoky and dirty, but it is well situated at the base of hills on the river Don, a tributary of the Humber. Its most interesting public building is the Cathedral, St Peter's, originally built in Norman times and burnt during the wars waged between Edward III and the barons, but since rebuilt, the oldest standing part, the tower, dates from the 14th century. The fine modern City Hall was opened in 1932.

Sheffield University, founded in 1879 by Mark Firth, a local steel manufacturer, comprises, besides the departments of medicine, arts, science, commerce, etc., a flourishing technical school with metallurgical laboratories and well-equipped workshops. The population of the city is about 518,000.

Shell. Shells are not confined to the seashore. They are found in all parts of the ocean, sometimes buried in the mud and ooze of the ocean bed, or floating airily on the surface of the water a thousand miles or more from shore. Nor is it necessary to go to the sea for shells for they

abound in fresh-water ponds and streams and on land. As fossils, they are even found in the desert beds of dried-up seas, on lofty mountains and far down in the earth.

To the zoologist, shells are the coats of armour that molluscs and other animals form to protect themselves. The shell is composed of substances secreted by the glands of the animal's back. It consists largely of calcium carbonate (calcite), which is the basic material of limestone, chalk and marble, and lime is often obtained commercially by burning piles of shells.

As the animal grows in size, its shell increases in thickness and extent. The lines of growth are usually clearly marked by the ridges running parallel to the outer or free edge, as in the oyster and mussel. The other ridges and protuberances on a shell are caused by corresponding projections on the "mantle" or muscular tissue which grows from the back, and from which the shell itself is secreted.

The mollusc shell consists of three layers. The outer surface is covered with a thin layer of horn-like material—the *periostracum*—which contains no lime. Beneath this there is found a layer of



SHEFFIELD'S CITY HALL

Citizens of the great Yorkshire city of steel and cutlery are very proud of their City Hall, begun in 1928. Top, is the main entrance hall, and immediately above is the front bay, with its classical portico, a colonnade of eight Corinthian columns with a deep recess for three wrought-iron entrance gates.

Photos top Keystone tower "Sheffield Telegraph"

SEA-WATER HOMES OF PORCELAIN AND PEARL



Here are shells from far and near 1 Abalone or Ear Shell. 2 Crusader's Scallop. 3 Turk's Cap. 4. Coil Shell of the Pond Snail. 5 Worm Shell. 6 Distaff Spindle. 7 Two Anger Shells. 8 Arched Slipper Shell. 9 Marbled Cone Shell. 10 Showy Chiton. 11 Watering Pot Shell. 12 Fossil Lamp Shell. 13 Spiny Frog Shell. 14 Camp Olive Shell. 15 Tiger Top Shell. 16 Harp Shell. 17 Pearly Nautilus. 18 Tiger Cowry. 19 Channelled Basket Shell. 20 Painted Thorny Oyster. 21 Great Triton or Triton's Trumpet.



GIANT CLAM OF THE BARRIER REEF

The Great Barrier Reef of Australia is one of the most wonderful places in the world for marine life, and one of its most marvellous inhabitants is the giant clam. This mollusc may have a shell several feet long, and, if your leg is gripped in one when the tide is low, your chances of escaping drowning are very small indeed!

very small prisms of calcite. Lastly, forming the internal layer, is the *nacre*, or "mother-of-pearl," composed of alternate layers of carbonate of lime and a horny substance arranged parallel to the surface. The free edges of these layers refract the light and thus produce the beautiful iridescent appearance which we prize so highly.

The outside of the shell may be almost any colour, though not usually green or blue, but generally combines several colours in a pattern. Shells of the tropics are as a rule more highly coloured than those of temperate zones.

Despite their great variety of form nearly all shells fall into one of two great groups—those in one piece, like the snails, and those which consist of two pieces hinged at the back, like the oysters. The one-piece shells are called "univalves," and the two-piece shells "bivalves." All the land shells are univalves, but the shells found in the water may be either univalves or bivalves. (See Molluscs)

The largest of the known shells is the giant clam of the Indian and Pacific Oceans, which frequently reaches from 2 to 3 feet in diameter and sometimes weighs 400 lb or more. So hard do the shells become that the natives of the Caroline Islands make axes out of them.

Divers for pearls and sponges are said to have been trapped by this great shell, and to have cut off hand or foot as the only way to escape death by drowning, while other people, after getting trapped by the shell at low tide, have been drowned on the tide rising.

Many shells which produce mother-of-pearl are manufactured into articles such as brooches, bracelets, necklaces, and buttons, and the "helmet shells" are notable for their use as cameos. They have a dark coat under a pale outer layer, so that figures carved on them stand out in bold relief against the black, red, pink, or orange background.

Among many primitive peoples shells were used for money. The most widely-used shells for this purpose are the beautiful cowries which exhibit an endless variety of colour and shape. The "ringed cowry" is still the usual currency in a few of the more remote of the Indian and Pacific islands, and some tribes in the interior of Africa use strings of the "money cowry."

The currency of the American Indians, known as "wampum," consisted of cylindrical fragments of hard clam, whelk, and periwinkle shells, rubbed smooth on stones and strung like beads on fine strands of skin.

Shelley, PERCY BYSSHE (1792–1822) The poet of clouds and sunsets and rainbows, of the swift wind, of the blue depth of the boundless sky, of the soaring skylark, Shelley seemed more at home in the heavens than on the earth. And yet the great purpose of his troubled life, as he saw it, was not to soar among the clouds and write beautiful poetry.

His ruling passion was to make the world better, to free mankind, "to purify life of its misery and evil." His work was ineffectual, for his schemes for reform were impractical and he knew little of real life, as a poet, however, he ranks among the highest in English literature.

Born on Aug 4, 1792, at Warnham, Sussex, he grew into a beautiful youth, of slender figure, with luminous large blue eyes, at times soft and dreamy, and at other times lit up with a wild and restless brilliance. But his schoolmates at Eton could not understand his strange and violently expressed opinions, calling him "mad Shelley."

He imbibed the spirit of the French Revolution, which was still in the air, and rebelled against the tyranny that he thought he saw everywhere, in government, in society, and in religion. He was expelled from Oxford University for writing an attack on religion, entitled "The Necessity of Atheism," and his father, a baronet of an old Sussex family, cast him off.

Though entirely without means, Shelley married a girl of 16, out of pity, because he felt that she, too, was oppressed and misunderstood. In 1818 he left England for Italy, where he lived for the remainder of his days. His first

SHELLEY

marriage had ended tragically, and he had married again, this time finding sympathy and understanding with Mary Wollstonecraft, author of "Frankenstein," and daughter of the revolutionary, William Godwin.

During these last years he wrote his beautiful poetic drama, "Prometheus Unbound," and those matchless lyrics, "The Cloud," "To a Skylark," and "Ode to the West Wind." Here, too, he wrote his wonderful elegy, "Adonais," on the death of his brother-poet, John Keats, little knowing how soon his own life was to be cut short. He was drowned in July 1822, while sailing with his friend Lieut. Williams off the coast of Leghorn. The bodies were recovered and cremated, and Shelley's ashes were buried at Rome.

In addition to those mentioned, Shelley's chief long poems are "Queen Mab" (1813), "Alastor, or The Spirit of Solitude" (1815), "The Revolt of Islam" (1817), "The Cenci," a tragedy (1819), "The Witch of Atlas" (1820), and "Epipsychidion" (1821). (See portrait in page 1535)

Shepherd's Purse.

Few garden weeds are so familiar as this little plant (*Capsella bursa pastoris*), with its tiny white flowers and pinnate leaves. It gets its name from the strange shape of the seed-vessels, which look like little heart-shaped purses. Among our wild plants are many of its close relatives, such as the "Jack-by-the-hedge," which also goes by the name of garlic hedge mustard (*Sisymbrium irio*). This

is a tall plant, with bright green, heart-shaped leaves and small white flowers, which show its membership of the order *Cruciferae*.

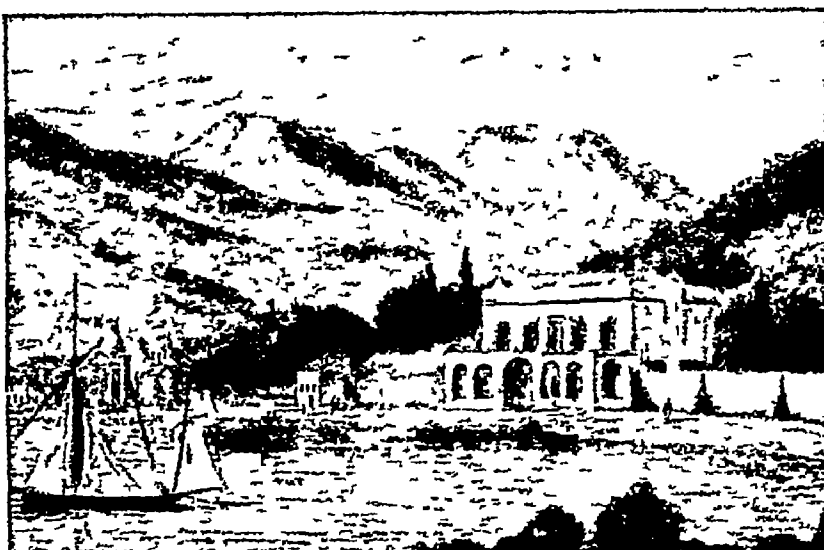
Sheridan, RICHARD BRINSLEY (1751-1816) Sheridan was the only man of his, or any age, to make an equally deep impression as an active politician and as a dramatist. He was by temperament suited for both the theatre and the House of Commons, in both of which independence of thought and purity of motive were then sadly lacking. With the true Irishman's vivid imagination, absence of self-consciousness and mastery of oratorical devices, he was able to hold his audiences spellbound, and both Westminster and Drury Lane appreciated his wit, charm and originality.

A member of a famous family, Sheridan was born in Dublin on October 30, 1751. His father was Thomas Sheridan, the actor, and his mother was the author of two or three plays. From his

SHERIDAN

parents he probably received a larger measure of his education than he acquired from Harrow School, where he attended for six years, and in 1770 he was taken by them to Bath, where his father taught elocution.

There Sheridan not only found plentiful material for the comedies he was to write, but also made the acquaintance of Elizabeth, the beautiful daughter of Thomas Linley, the composer, whom he escorted to France when she desired to escape the attentions of a persistent suitor. Near Calais they were secretly married, but, fetched home by Linley, Sheridan was separated from his wife for a year, ultimately marrying her openly in 1773. They then settled in London, where, in 1775, Sheridan having



SHELLEY'S LAST RESIDENCE

To the Casa Magna, a large house standing on the shores of the Gulf of Spezia, Shelley and his wife went to spend the summer of 1822 with their friends the Williamses. Returning home from Leghorn in the small schooner Ariel (seen in the illustration above), Shelley and Lieutenant Williams were drowned on July 8, though whether the boat capsized or was run down by another has never been settled.

meanwhile had much practice but little profit in writing, his first comedy, "The Rivals," was produced. It attained great popularity almost immediately, and its author's fame as a dramatist was established. "St. Patrick's Day," or "The Scheming Lieutenant," a farce, and "The Duenna," a comic opera, were successfully produced in the same year, and in 1776, with two partners, one his father-in-law, Sheridan purchased the management of the Drury Lane Theatre, with which he is inseparably associated.

Sheridan's second production at Drury Lane, in May 1777, was his greatest comedy, "The School for Scandal," which, with its skilful satire, was only licensed by the Lord Chamberlain on account of his friendship with the author. His dramatic career lasted in all only four years. Yet in this time Sheridan produced such immortal figures of fun as Mrs. Malaprop and Sir Lucius O'Trigger, who appear in "The

SHERIDAN

Rivals," and Charles Surface and Lady Teazle, from "The School for Scandal "

Meanwhile Sheridan's ready wit (he was accounted the wittiest man of his age) and his social charm had made him a favourite in literary and political circles, he was a member of Dr Johnson's literary club, and a close acquaintance of Charles James Fox, and in 1780 he was persuaded to seek election to Parliament. After one unsuccessful attempt he entered the Commons as Whig member for Stafford. His real oratorical ability found frequent utterance in the House, and in a short time he had become its most brilliant and, probably, its most influential speaker, being particularly well known for his speeches in opposition to the war with America.

But as a politician Sheridan is chiefly remembered in connexion with the impeachment of



RICHARD BRINSLEY SHERIDAN

Sheridan is the only man who has made an equally deep impression as politician and as dramatist. One of the most gifted of Fox's adherents, he remains a master of the comedy of manners.
After Sir Joshua Reynolds



REVIVAL OF 'THE RIVALS'

Our photograph shows two well-known actresses, Isabel Jeans and Beatrix Thomson, as Lydia and Julia in a production of Sheridan's play, "The Rivals," at the Lyric Theatre, Hammersmith, in 1925. These parts were played originally, at Covent Garden in 1775, by Miss Barsanti and Mrs Bulkley.

J. S. Campbell

SHETLANDS

Warren Hastings, in which, by his brilliant oratory attacking the accused, he made an issue that roused the whole nation. From 1787 until 1794 he was indefatigable in his speeches on this subject, the dramatic situation suited his theatrical talents ideally, and frequently, as manager of the trial from 1788, he roused the benches to applause as loud and appreciative as he ever received at Drury Lane.

The rest of Sheridan's life was overshadowed by financial embarrassments. A gambler, a lover of display, and generous to a fault, he regularly overspent the annual income of £10,000 which Drury Lane brought him, moreover, the theatre had to be rebuilt in 1791,

and again in 1809, when it was destroyed by fire. His financial affairs went from bad to worse, and in 1813 he was imprisoned in a sponging-house. These matters and personal worries had a severe effect on Sheridan's health. He died, with a sheriff's officer beside his bed, on July 7, 1816, and was buried, through the generosity of friends, in Westminster Abbey.

Shetland Islands, SCOTLAND It was probably to the Shetlands, which were inhabited by a short dark people called the Picts, that the ancient Romans gave the name *Thule* or *Ultima Thule*, "the farthest land," or end of the world. To the Vikings of Norway and Sweden these northern outposts of the British Isles were near neighbours, a new kingdom where they could taste of the fierce joys of piracy, feasting and combat.

On every hand the traveller is confronted by some reminder of these ancient times—a burial-mound, where the people of the Stone Age laid their chieftains to rest, a mysterious stone circle, marking the scene of some ancient Pictish rites, or a crumbling tower, a stronghold of this vanished race.

There is a charm in this land of rolling seas and sweeping winds, where the waves dash like a charge of plumed cavalry against the high and brilliantly coloured cliffs, and have carved out from solid porphyry rock a great staircase known as the Grind of the Navir, or Gate of the Giants. Everywhere is the sight or sound of the sea, for even the largest island is so broken by bays that no point is more than three miles from the ocean. Little except potatoes and scanty crops of oats and barley can be grown.

Fishing has always been the leading industry, supplemented by the raising of cattle and sheep and the little Shetland ponies. Some woollen goods are manufactured from the fine Shetland yarns, for which the islands are famous.

Situated 120 miles north-east of the mainland of Scotland, and only about 200 miles west of Norway, the Shetlands (or Zetland) number about 100 islands, of which approximately a quarter are inhabited, and cover about 550 square miles. The most important is Mainland, which contains about two thirds of the total area of the islands, and has at Lerwick (population, 4,200) a thriving seaport, one of the finest natural harbours in Great Britain. The town is connected with Inverness and the Orkneys by a regular passenger and mail air service. The



SHETLAND PEASANTS AND THEIR PONIES

Here is a picturesque scene of Scottish rural life. The two women are taking to market at Lerwick, the county town of the Shetland Isles, their farm produce carefully stowed in panniers carried by the sturdy little Shetland ponies. The islands are thought to have been the Ultima Thule of classical writers.

Photo Chas. Reid

group was ceded by Norway to Scotland in 1468, and constitutes a Scottish county. The population of the Shetlands is about 21,400.

STATELY SHIPS *that* SAIL *the* SEA

Untold thousands of ships, from the frail cockle-shells of past ages to the sleek ocean greyhounds of today, have linked far-spread countries together by ties of commerce and culture. Here their tale is told.

Ships and Shipbuilding. To the Egyptians belongs the credit of having built the first ships for 6,000 years ago they had vessels capable of carrying 50 passengers. After that, there was little development until the time of Columbus, while the history of the modern ship dates only from the beginning of the 19th century, when steam began to replace sails as the motive power, and first iron, then steel, was used in the construction of the hulls.



A Swedish barque

The progress between the middle of the 16th century and the middle of the 19th century was infinitesimal compared with that of the subsequent 80 years. In the 16th century there were ships of from 800 to 1,000 tons, but they were under 200 feet in length, their big tonnage being due to their breadth of beam. Such ships as the famous 19th century clippers were from 800 to 1,000 tons, and were from 200 to 350 feet in length. The greatest change between the early

ships and the later ones was in the rigging. Ships of the time of Columbus had from one to three masts, but only one or two sails on each mast, while the full-rigged ships of the 19th century sometimes carried six square sails on each mast, staysails between the masts, and jibs between the foremast and the bowsprit.

As England grew to be the mistress of the seas, ships that would be recognized by a sailor of today began to appear on the seas—full-rigged ships, barques, brigs, etc.

Previously the hulls of merchant ships had been constructed for capacity rather than speed. The loss and ruin sometimes incurred in the East India and China trade through deterioration of cargoes on the slow sailing East India-men of the late 18th and early 19th centuries stimulated the construction of a new type, viz., the "clipper" ship—a long, slender vessel with fine lines, sharp bows, towering masts, and an immense spread of sails.

In the closing decades of the 18th century many experiments were made with steam propulsion. In 1819 the first vessel fitted with steam-power crossed the Atlantic. This was the American-built Savannah, which ran from Savannah to Liverpool in 25 days, most of the time, however, under sail. The engines of those

SHIPS & SHIPBUILDING

days consumed about four times as much fuel as modern engines for every horse-power produced, so the problem of a transatlantic steam passage was a fuel problem. The Savannah's voyage and the one or two transatlantic passages made by steam vessels in following years made such slight impression that in 1835 sober people scoffed at the suggestion of a steamship line between Great Britain and North America.

A visitor from Mars could scarcely have created a greater sensation in 1838 than the arrival in New York of the *Sirius* from London, which had made the run from Cork in 17 days entirely under steam. A few days later the

wood resists a crushing force better than metal, and wooden ships are therefore favoured for voyages in polar seas, where icebergs and floes are to be encountered.

Iron construction saves 30 to 40 per cent over the weight of wood, and steel saves 15 per cent over the weight of iron. This means increased carrying capacity and lower freight rates. Welding transforms the ship practically into a piece of solid steel. Therefore the only limit to the size of modern steel ships is virtually the size of harbours and docks.

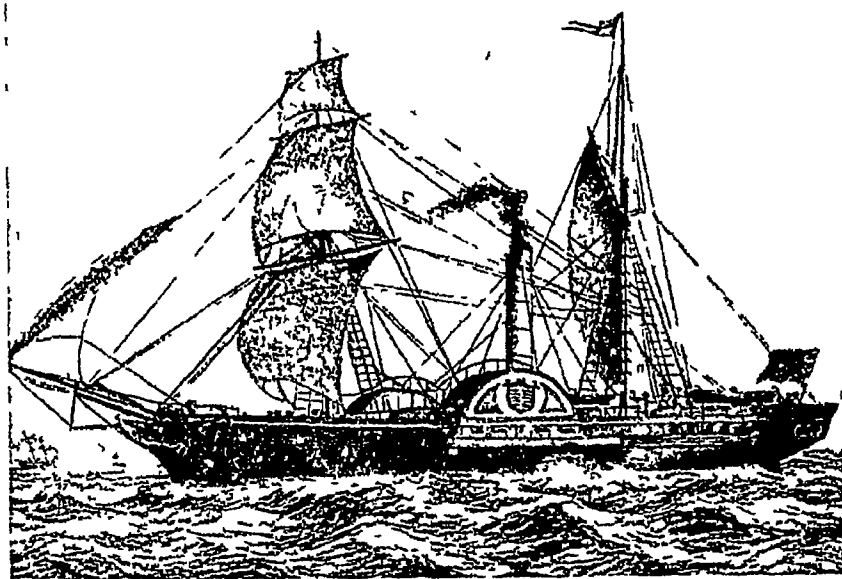
The factor which resulted in Britain coming to the fore in building steel ships was the advanced state of development of the British steel industry, which was ready at the time of the revolution in shipbuilding to employ Bessemer's discovery in the construction of ships (See Iron and Steel).

The earliest steamships were propelled by paddle-wheels, but an American inventor, Col John Stevens, had worked out the principles of screw propulsion of steam vessels in the early 19th century. American tools and machinists were not, however, then equal to reproducing Stevens' beautiful models. The first ocean screw steamships were built in England between 1836 and 1839 by an Englishman, F P Smith, and a Swede, Captain John Ericsson, later of Monitor fame.

Paddle-wheels offered an inviting target to an enemy in war, the advantage of the screw propeller, placed below the water-line, quickly appealed to naval authorities. Merchant vessels were slower to discard the paddle-wheel, chiefly because the marine engines then in use could not economically drive screw propellers. About four years after "Inman's iron screws" were introduced the compound engine (see Steam-engine) was adapted to marine use, and the screw propeller became the recognized mode of propulsion.

Screws and Turbines

Twin screws, considerably lessening the danger of the ship becoming disabled through damage to a single propeller, came later, three and even four screws are used on some steamships today. The triple expansion engine followed, and this was the last word in marine engineering until the application of the turbine to steamships. The first turbine steamboat, the *Turbinia*, demonstrated in 1897 the sensational speed



IN THE EARLY DAYS OF STEAM

One of the earliest vessels to make the passage of the North Atlantic under steam was the *Sirius*, seen above, which made the run from Cork to New York in 1838 in 17 days, carrying 100 passengers. She was one of the first steamers to be fitted with a condenser instead of using salt water for the boilers.

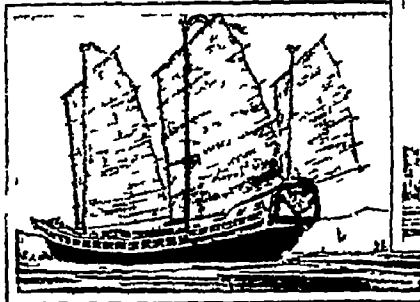
From a lithograph in the Science Museum, South Kensington

Great Western, the first steamship specially built for transatlantic service, arrived from Bristol. The transatlantic steam liner was now an accomplished fact, and before long the "seven seas" had a network of steamship lines.

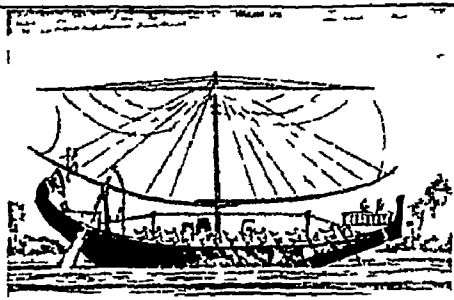
Early steamships were built of wood, but experiments in the use of iron had been made before the end of the 18th century. Between 1845 and 1880 iron entered more and more into general use, and gradually superseded wood for all large vessels.

The first steel steamboats were built in the 1850's for the exploration of African inland waters. Not until the '70's was steel used for ocean-going vessels, but from 1880 on steel gradually replaced iron, until today "steamship" practically means "steel ship". An iron or steel vessel is not only stronger but lighter than a wooden vessel of the same size, though

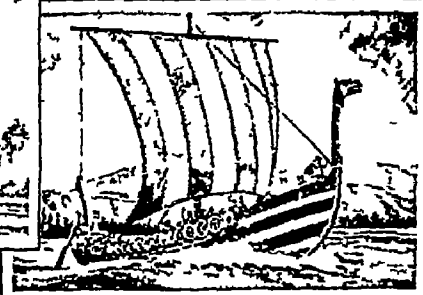
SAILING SHIPS THROUGH THE CENTURIES



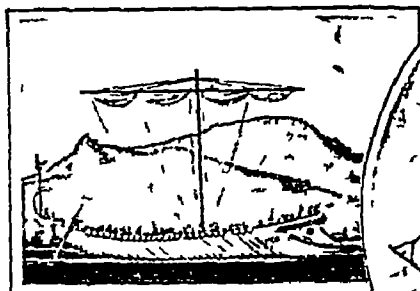
CHINESE JUNK



EGYPTIAN SHIP - 1500 B. C.



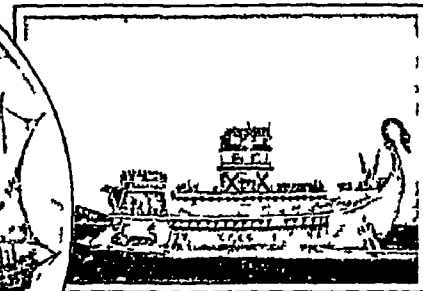
VIKING SHIP - 1000 A. D.



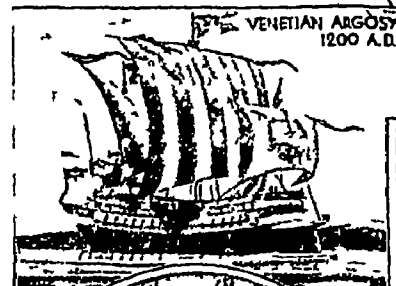
PHOENICIAN GALLEY - 450 B. C.



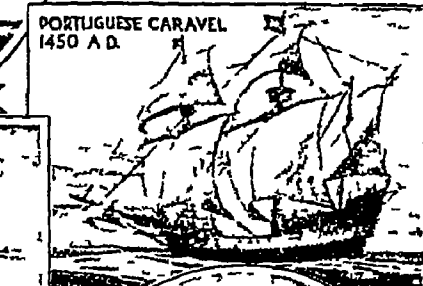
SPANISH GALLEON - 1580 A. D.



ROMAN TRIREME - 100 A. D.



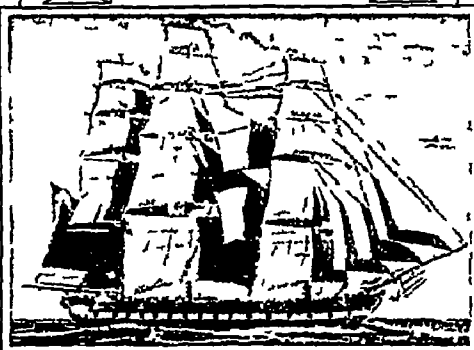
VENETIAN ARGOSY
1200 A. D.



PORTUGUESE CARAVEL
1450 A. D.



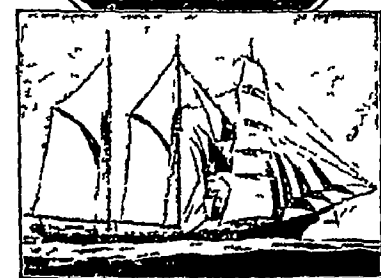
ENGLISH WARSHIP - 1765 A. D.



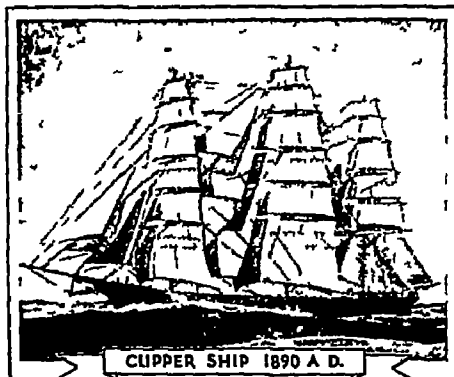
AMERICAN FRIGATE CONSTITUTION - 1800 A. D.



DUTCH MERCHANTMAN - 1650 A. D.



BARQUENTINE 1880 A. D.



CLIPPER SHIP 1890 A. D.



FORE-AND AFT SCHOONER—MODERN

From the hollowed-out log canoes of the first adventurous voyagers by water to the graceful swift clipper-ships of the 1850's, stretches a span of time that we cannot even guess. But during those thousands of years, with all their ingenious development of form, there were only two methods of propulsion—first oars, then oars and sails or sails alone. In the pictures above are many of the types of ships developed before the coming of steam navigation at the beginning of the 19th century. The Chinese junk is undated because there has been little change in its design for 2,000 years or more. Note the development of rigging, from the simple sails of the early Egyptians and Phoenicians, and even the Vikings, to the fine billowing sails of the frigate Constitution ("Old Ironsides") and the fast-speeding barquentine and clipper ship, almost the last champions of sail on the high seas.

SHIPS & SHIPBUILDING

capabilities in this mode of propulsion (See Turbine) The Queen Mary, whose engines are four sets of turbines, has crossed the Atlantic at an average speed of over 30 knots, but speed on the ocean is a costly luxury The fuel burned in one day by a large modern liner would drive a tramp steamer of 6,000 tons freight-carrying capacity backwards and forwards between New York and Liverpool three or four times, running at a speed of nine or ten miles an hour A large liner using coal might consume 1,000 tons a day at full speed

The cost and bulk of the fuel required for high speed forbid the freight steamship to exceed the limits dictated by freight rates, while the less expensive passenger liners make no attempt at speed records

Great savings in labour and space have been made by equipping steamships to burn oil in their furnaces Some of the smaller modern liners are driven by internal combustion engines working on the Diesel system, burning crude oil, and for them stokers are unnecessary

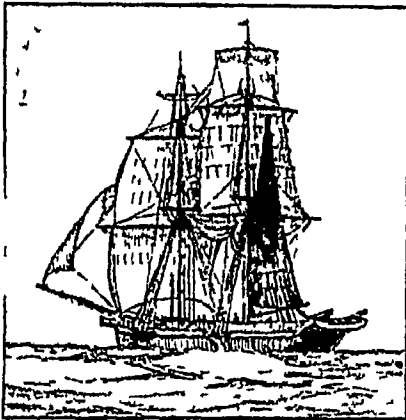
Some "floating palaces" have as many as 12 decks, electric lifts, gymnasiums, swimming pools, libraries, children's play-rooms, chapels,

cinemas and music-rooms, lounges or drawing-rooms, smoking-rooms, and private suites

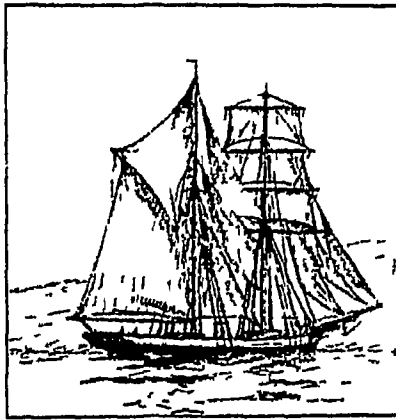
Modern merchant ships may be roughly classed as (1) liners for passenger services only, (2) ships carrying passengers and cargo, and (3) cargo ships The liners include the largest, swiftest, and most luxurious ships afloat The most important of them are the Queen Mary (81,235 gross tons) and the Berengaria (52,101 tons), both belonging to the Cunard White Star Line, for whom the 84,000-ton Queen Elizabeth and the 32,000-ton Mauretania are under construction, the Empress of Britain (42,348 gross tons), Canadian Pacific Railway, the French liner Normandie (83,423 gross tons), the Italian ships Rex (51,062 gross tons) and Conte di Savoia (48,502 gross tons), and the German ships Bremen (51,731 gross tons) and Europa (49,746 gross tons)

Of the vessels in the second class, some are devoted to both cargo and passenger traffic, while others derive most of their revenue from a single branch, carrying cargo or passengers as a side-line

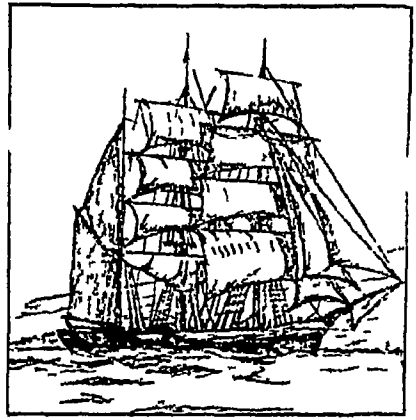
In the third class are included cargo liners, which keep to a definite course and schedule,



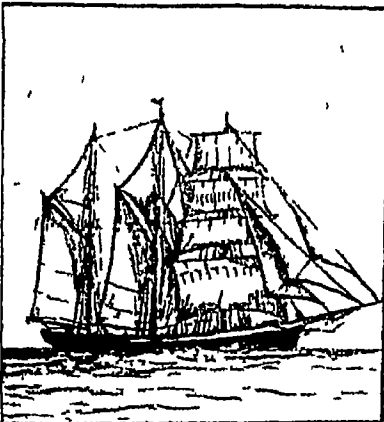
BRIG



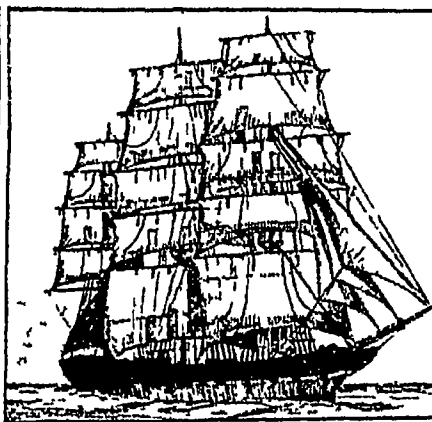
BRIGANTINE



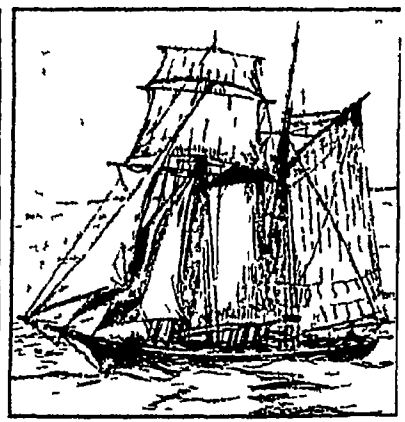
BARQUE



BARQUENTINE



FULL-RIGGED SHIP

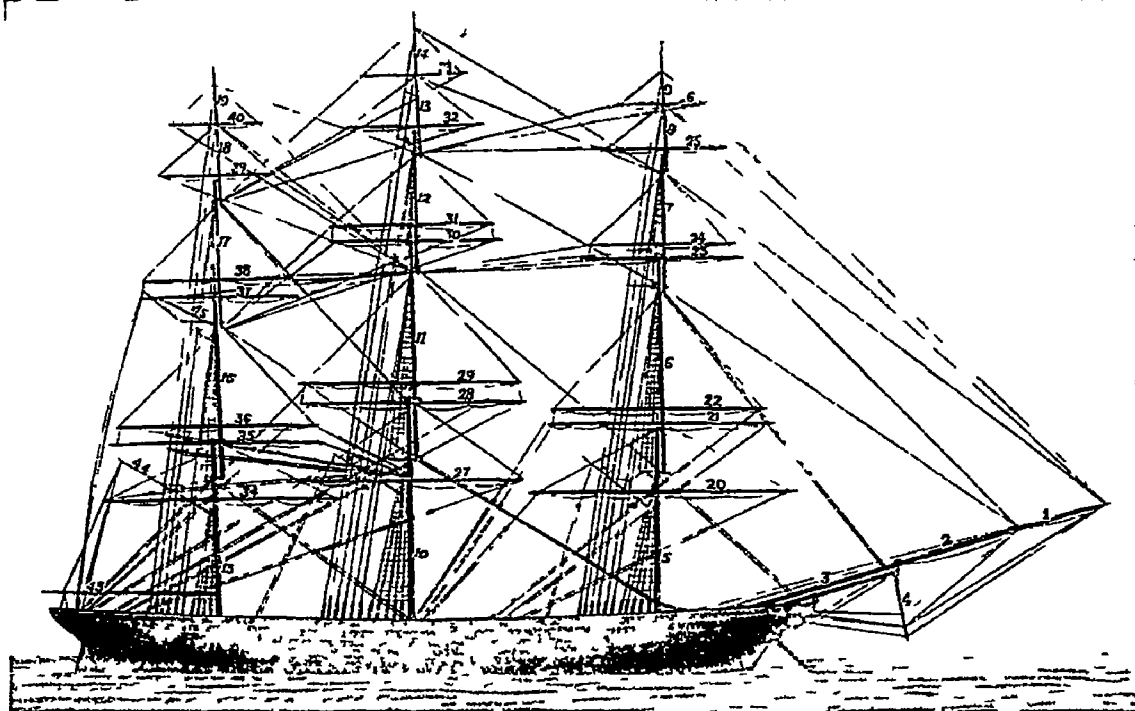


TOPSAIL SCHOONER

SOME WELL-KNOWN TYPES OF SAILING SHIPS

These illustrations show the chief rigs of sailing ships The brig (top left) carries single topsails, as did all ships until the middle of the 19th century, when the topsails were divided into two so that they might be more easily handled The rigs of brig, brigantine, barquentine, and topsail schooner were used for ships of small tonnage Those of barque and "ship" were for larger vessels There were also four-masted barques, with the three masts square rigged and one rigged fore and aft, and four-masted ships with all four masts square-rigged.

SPARS AND RIGGING OF A FULL-RIGGED SHIP



A FULL-RIGGED SHIP

Sailing ships may be divided into three distinct classes—the square-rigged, the fore-and-aft rigged, and the mixed-rigged. The square-rig, which is illustrated above, consists of sails hung from horizontal yards, which are slung at their middle points to the mast. When the ship is sailing before the wind, these sails are spread at right angles or “square” to the keel. A full-rigged ship—a “ship” in the technical sense—has three masts, all square-rigged, called from bow to stern the foremast, the mainmast, and the mizzenmast. A “brig” has only two masts, the fore and main.

A full-rigged ship may carry five or more sails, one above the other, on each mast. The same names are applied to the corresponding sails and spars on each mast, except that the name of the mast is prefixed. In describing the rigging of a ship we shall refer to the foremast, but in every case in which a corresponding spar is used on the main or mizzenmast the number of the corresponding spar will be given, so that you can locate, for example, the fore topmast (6), main topmast (11), and mizzen topmast (16).

Each mast comprises five separate parts or masts. The bottom one is called the foremast (5), mainmast (10), or mizzenmast (15) as the case may be, and the upper ones, in order, are the topmast (6, 11, 16), the topgallant mast (7, 12, 17), the royal mast (8, 13, 18), and the skysail mast (9, 14, 19).

Square-rigged ships usually carry a set of triangular sails called jibs, hung on stays strung from the foremast to a jibboom (2), and to a flying jibboom (1), which project from the bow. Below the jib is a vertical stay called the martingale (4). These jibs serve to “keep the nose up” that is, to keep the sails on the mast from tending to tilt the

vessel forward, and thereby drive the bows too heavily into the seas. The bowsprit (3) is the timber which supports the jibboom.

The bottom yards or arms, extending horizontally from the masts are the foreyard (20), the mainyard (27), and the cross jackyard (34). Next above these are the lower topsail yards (21, 28, 35), then the upper topsail yards (22, 29, 36), the lower topgallant yards (23, 30, 37), the upper topgallant yards (24, 31, 38), and the royal yards (25, 32, 39). The topmost yards are the skysail (26, 33, 40). On the mizzenmast are a number of special spurs—the spanker boom (43), the spanker gaff (44), and the monkey gaff (45).

The fore-and-aft rig consists of one large sail to the mast. This may be spread between a horizontal boom at the bottom and a shorter gaff above. The gaff is a spar fastened to the mast by a collar, it points midway between horizontal and vertical, and can be raised and lowered by hal-yards. The sail swings to one side or the other of the mast, or directly behind it (“aft”). Such sails can be handled from the deck, so that a large vessel may be manned by comparatively few men.

The single-masted “fore-and-aft,” with a gaff mainsail and a jib, is called a “cutter” with two or more masts, and a jib, a “schooner.” A cutter with a smaller second mast is called a “yawl.”

Vessels with mixed rigs, the third class, carry both square and fore-and-aft rigging. A two-master with square rigging on the foremast, and fore-and-aft rigging on the main, is a “brigantine.” A three-master with square rigging on the fore, and fore-and-aft rigging on the other two, is a “barquentine.” If only the mizzenmast is rigged fore-and-aft, it is a “bark” or “barque.”

HOW OCEAN GIANTS ARE PROPELLED AND GUIDED



The tiny figure of the man at the bottom of the picture will help you to realize how enormous are the rudder and propellers of a big modern ocean liner. The rudder alone weighs 70 tons—as much as a small locomotive. As the ship makes its massive way through the waves, the helmsman turns a small wheel high up in the wheel-house, instantly powerful machinery obeys the com-

mand and twists the rudder post, swinging the great rudder on its hinges with the smoothness and accuracy of a watch. The three giant propellers, projecting at the ends of their powerful steel shafts, likewise obey the touch of the engineer's hand, threshing the water with their curved blades to drive the vessel forward or reversing to check it suddenly in its headlong course.

SHIPS & SHIPBUILDING

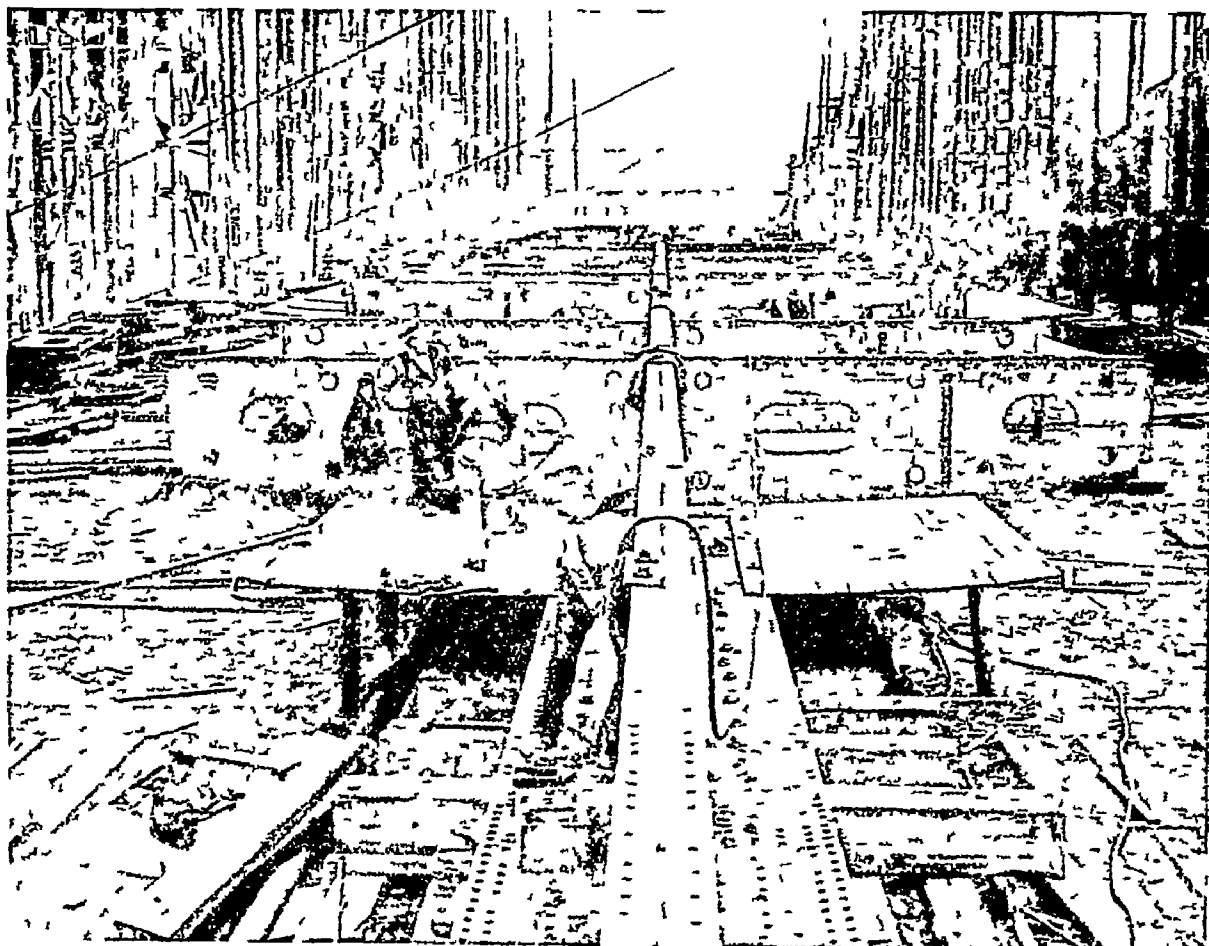
like passenger liners, tramps, which ply all over the world, wherever they can pick up a cargo (see Commerce), and vessels built and operated for special classes of traffic

Among the most interesting of special ships are the ferries that carry trains across comparatively narrow stretches of water which, however, are too wide to be bridged. In 1936 a train ferry was inaugurated between Dover and Dunkirk. Three ships operate it, each named after a famous Thames ferry—Twickenham Ferry, Hampton Ferry, and Shepperton Ferry. They are of 2,840 gross tonnage, 360 feet long, and over 80 feet broad. Amidships there are four sets of railway lines, narrowing down to two at the stern. At Dover and Dunkirk the ferry ships enter a dock, and water is pumped in until the deck of the ship is level with the edge of the dock down to which the railway lines run. A drawbridge fitted with rails is then lowered from the stern of the ferry to connect the ship with the shore, and the coaches of the train are pushed on board. As the ferry boats

are very broad their speed is not high, being only about 15 knots (See illustration in page 3426)

Great Britain has the largest merchant fleet in the world. In 1938 there were 9,711 ships of over 100 tons having a total gross tonnage of 20,629,509. The United States came next with 3,485 ships with a total gross tonnage of 12,429,613, and Japan third with 2,564 ships and a total gross tonnage of 4,475,110.

A ship's size and capacity are expressed in terms which are somewhat confusing unless certain distinctions are kept clearly in mind. "Displacement" or "displacement tonnage" is the weight of the water which the ship displaces—in other words, the weight of the ship itself. "Dead weight tonnage" is a ship's maximum carrying capacity, or the difference between its displacement light and its displacement loaded to its limit. Passenger and freight liners are seldom or never loaded to the limit of their capacity, and the term is not used in connexion with them, but chiefly as a basis for charges on tramp steamers chartered to carry

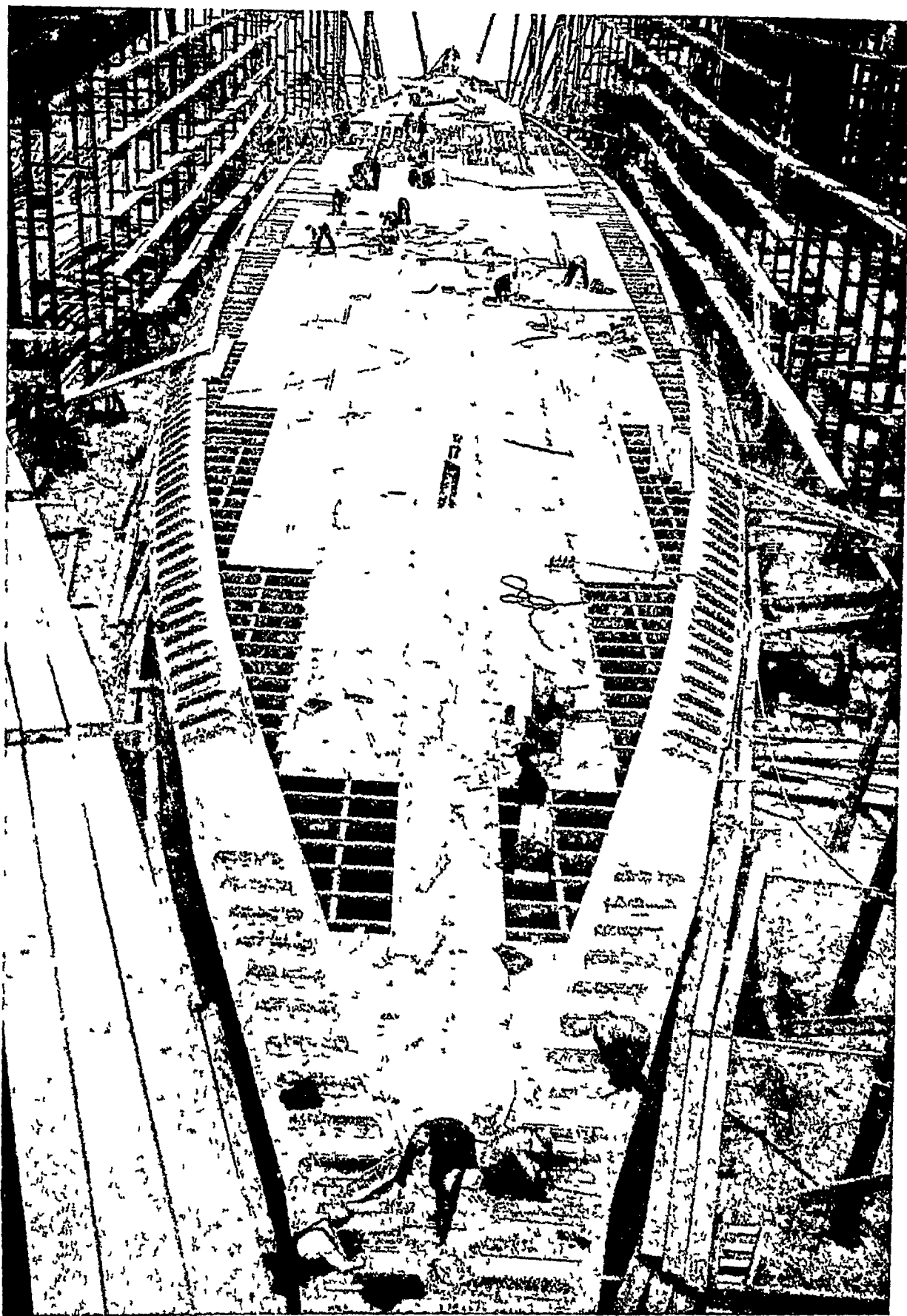


Fox Photos

RUGGED BEGINNING OF A GRACEFUL GIANT

By ships has Britain acquired her greatness, and today, as in the past, shipbuilding is one of the industries at which the British excel. Here we see a typical scene in a shipyard with the keel of a new liner laid in position—the first stage of a mighty task. Step by step, as time goes by, the great frame of steel is evolved until, when all is ready, the new ship slides from her birthplace ashore into the water to start her career afloat.

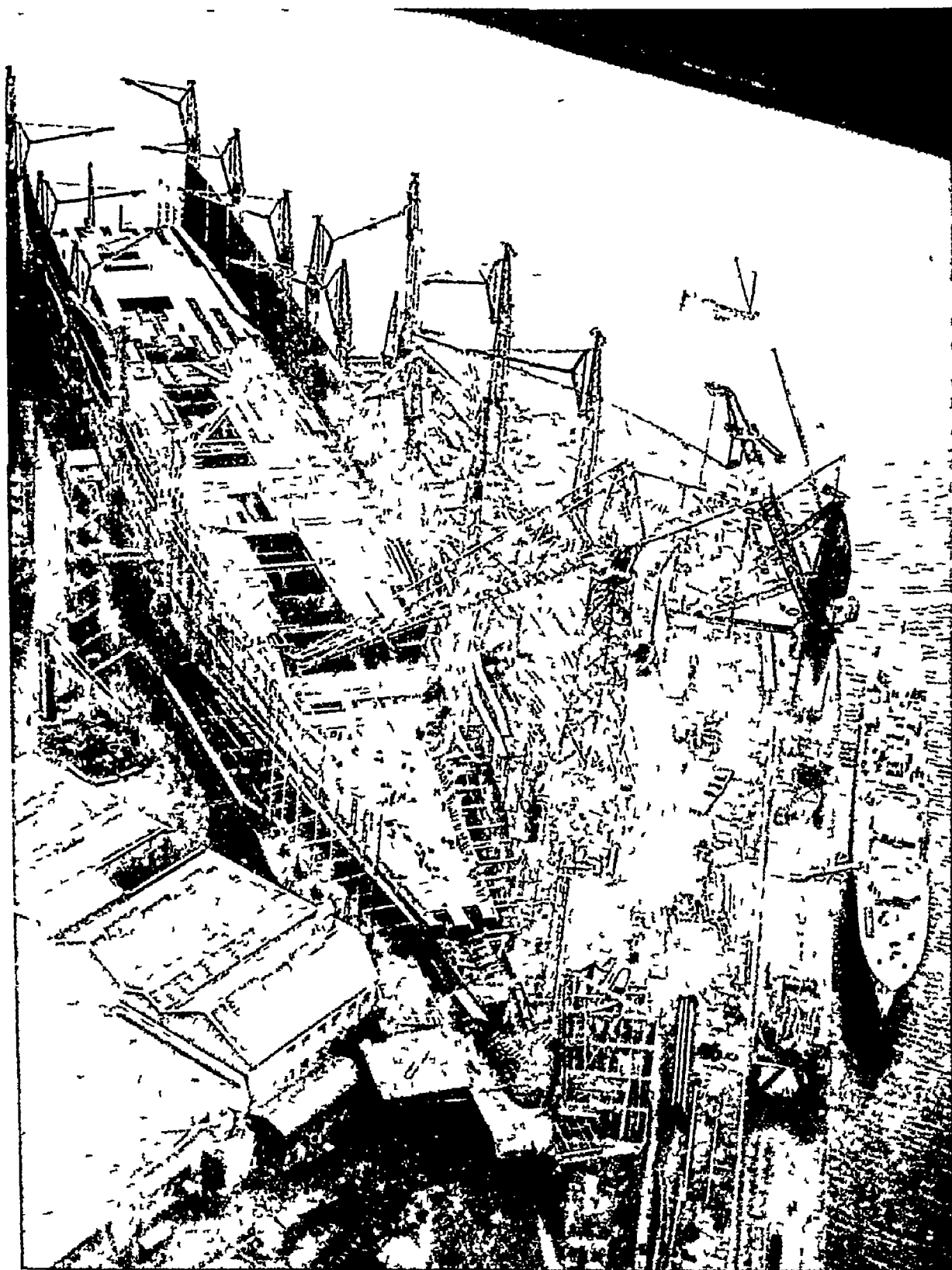
THE HUGE HULL GROWS AND TAKES ITS SHAPE



Fox Photos

To the deafening clamour of hammers, drills and clashing metal men toil to complete contracts for new craft in all the big shipyards of Great Britain. In this picture is shown a new ship for the Ellerman line under construction. Although still in the early stages, the shape of the hull is plainly seen. To unfamiliar eyes the mass of material surrounding the slipway is bewildering and apparently chaotic. Yet, in actual fact, all the work is done to a strict schedule and closest order.

NEW CUNARDER IN HER BERTH AT CLYDEBANK



Fox Photos

In this photograph, taken from a low-flying aeroplane, is seen Queen Elizabeth, successor to the great Cunarder, Queen Mary, in Messrs John Brown's yard at Clydebank. All around the building-berth stand powerful electric cranes and shops where the huge plates and bars are heated, cut bent and drilled. Everything is meticulously arranged so that, as the material is moved towards the slip it passes through the various operations in proper sequence and with the minimum of delay

SHIPS & SHIPBUILDING

heavy commodities "Gross tonnage" is defined as a ship's total measured cubic contents (in actual practice certain spaces are excluded from measurement in ascertaining gross tonnage) in "tons" of 100 cubic feet each. The official British mercantile marine statistics are estimated on the basis of gross tonnage. "Net tonnage" is what remains of gross tonnage after deduction of space for fuel, machinery, crew's and officers' quarters, and other spaces devoted to purposes necessary for operation of the vessel. It is sometimes estimated that net tonnage averages about two thirds of gross tonnage, but the ratio between gross and net tonnage varies widely in individual vessels, net tonnage may be very insignificant in an "ocean greyhound." The basis for tonnage dues is net tonnage, calculated according to arbitrary rules.

Great Ships in the Making

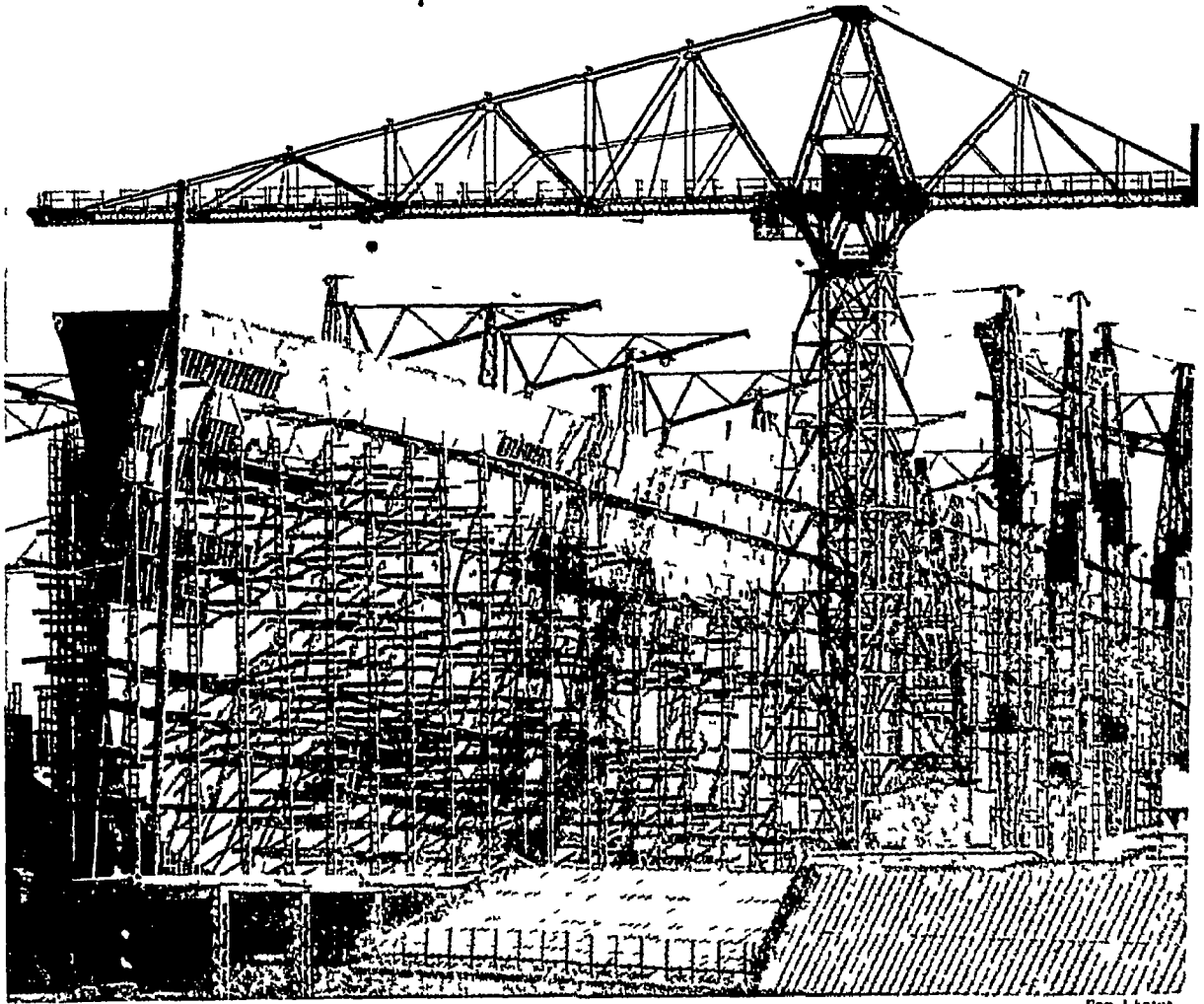
Now let us turn to see how modern ships are built. A great shipbuilding yard, in busy times, presents a wonderful spectacle of thousands of workmen of many different trades, scattered over an enormous area, and yet all organized

and working to time upon one great task—the building of the gigantic liner that grows slowly but steadily day by day on its slipway.

It may take two or three years to complete a modern Atlantic liner, and the men who are riveting the steel plates of her hull may be working hundreds of yards away from their fellow-workmen who are engaged upon other constructional work. But so well organized are the many departments, and with such unity does the organization move, that everything is ready just when it is needed.

The visitor who sees the shipbuilders at their work in a great British shipyard, such as those at Belfast or on the Clyde, might think at first that he had strayed into a railway goods terminus. Railway lines cross and recross one another in every direction, locomotives are pushing and pulling loads of steel, and whistles and bells keep our nerves on edge at every turn.

As we penetrate farther into the yard, where we are told as many as 12,000 men are employed when shipbuilding orders are plentiful, our ears are assailed by the clamour of crashing metal,

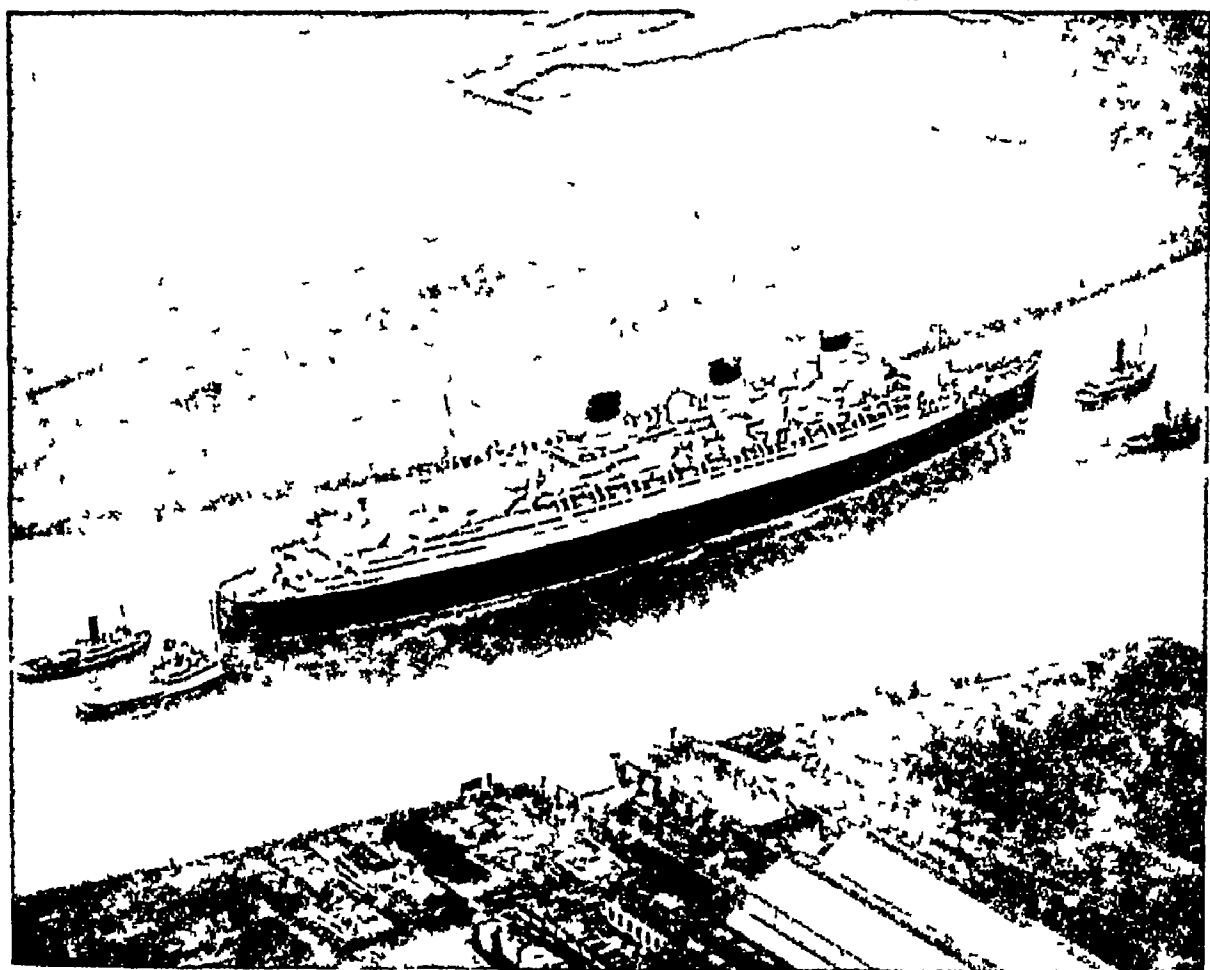


A NEW SHIP'S TOWERING BOWS IN A MIGHTY CRADLE

For photos

Dwarfing everything else that stands around her, the new Cunarder, Queen Elizabeth, is majestic even in her partially-finished state. As can be seen in this picture, the platers' work is well in hand. Here and there can be discerned the frames to which the exterior plates are riveted. This work is done by hydraulic machines and pneumatic hammers. Launching takes place when the skin, bulkheads and propeller shaft tunnels are finished, and the rudder, propeller shafts and propellers are in position.

MAMMOTH STEAMSHIP LEAVES HER BIRTHPLACE



Fox Photos

No ship in all the world aroused so much public interest as the Queen Mary, and, when she was launched, Sept. 26, 1934, thousands watched beside her building-berth. In the upper picture we see the vessel riding in the Clyde, just after she had left the standing ways. Slowly and gracefully she moved from the land as the shores were knocked away and the cradles fell. The lower photograph taken from the air shows the liner in all her grandeur being shepherded down the Clyde after completion.

from which presently we are able to pick out individual notes—roaring foundries, clanging engines, whurring dynamos, and thundering hydraulic hammers. At the water's edge the cranes and scaffolding of the ships form a rough pattern of upstanding colossal lace-work. On the ground we find a strange litter of monstrous metal parts among which we pick our way.

Unfamiliar to many of us are the tasks of the men we see at work in the open air or in the vast interiors of the sheds and mills—furnacemen, rollers and flangers, punchers, shearers, acetylene cutters, electric welders, machine riveters, chippers, caulkers, yard riggers, besides clerks, draughtsmen, electricians, carpenters, machinists, painters, and unskilled labourers, employed on various specialized tasks.

We must not allow interest in the mechanical activities of construction to make us pass by the quieter but far more important tasks of the designers and draughtsmen. There are many problems to be worked out on paper, many drawings and calculations to be made, before so much as a rivet hole can be drilled or a bolt driven home.

Calculation before Construction

Such data as tonnage requirements, speed desired, and depth of water in the harbours which the ship is intended to frequent, are given to the designer of the ship to be constructed. He first calculates the displacement, and then determines length, beam, and depth. In accordance with these data he prepares his design, which is turned over to structural and engineering draughtsmen to work out in detail.

In recent years the work of the designer has been greatly helped by the National Physical Laboratory at Teddington, Middlesex. There models of the ship to be constructed are tested in tanks, the largest of which is nearly 700 feet in length. The models range from 6 to 20 feet in length, and special machinery creates waves similar to those of the ocean, enabling the behaviour of the ship in a heavy sea to be recorded. Rudders and propellers are also tested in such tanks, and the results are recorded by delicate instruments. These models are constructed in the laboratory from plans supplied by the designer. (See illustrations, page 2764)

When the design is finally decided upon, the drawings of it, and photographic "blue prints" (so called because of the blue paper on which they are printed), made to scale, are redrawn full size on the floor of the moulding loft. This room has a specially prepared floor, as smooth as a school blackboard. From the drawings on the moulding loft floor, full-size wooden or paper patterns are constructed for each piece of steel to enter into the vessel.

On each pattern or "template" every rivet hole, bend, flange, or angle line is accurately

indicated. The ship-fitter transfers these marks to the steel plate, which is then taken to the steel mill to be cut, bent, punched, and shaped in accordance with the indications of the template.

The actual construction of the ship begins with the laying of the keel. First, the slip for the ship is prepared at the water's edge. Keel blocks—short heavy timbers with the upper surface shaped to the keel line—are set up with a very slight incline toward the water. On this is laid the keel, composed of a number of bars or thick plates of heavy steel, riveted together to make the desired length and thickness. While the frames are being built up from the keel and the plates are being riveted, staging is erected inside and outside the hull.

Scales of Steel Strengthen the Hull

The steel plates which form the shell of the ship are laid, like giant fish scales, 20 to 40 feet long, in overlapping horizontal rows called "strakes." They provide the main strength of the hull. The seams of wooden ships are caulked with oakum and pitch, steel ships are caulked by driving down the overlapping edges of the upper plates so that they "bite" the plates below.

Large steamships are built today with double bottoms, which lessen danger if the ship should run aground and the hull be pierced. The space between the bottoms in large ships almost allows a man to stand upright at the centre of the hull. It is used for ballast or for storing fresh water for the boilers or oil for the engines. Still more important for safety are the bulkheads, or crosswise and lengthwise vertical partitions which divide the hull into watertight compartments so that if the ship is holed in one part of the hull that part can be isolated.

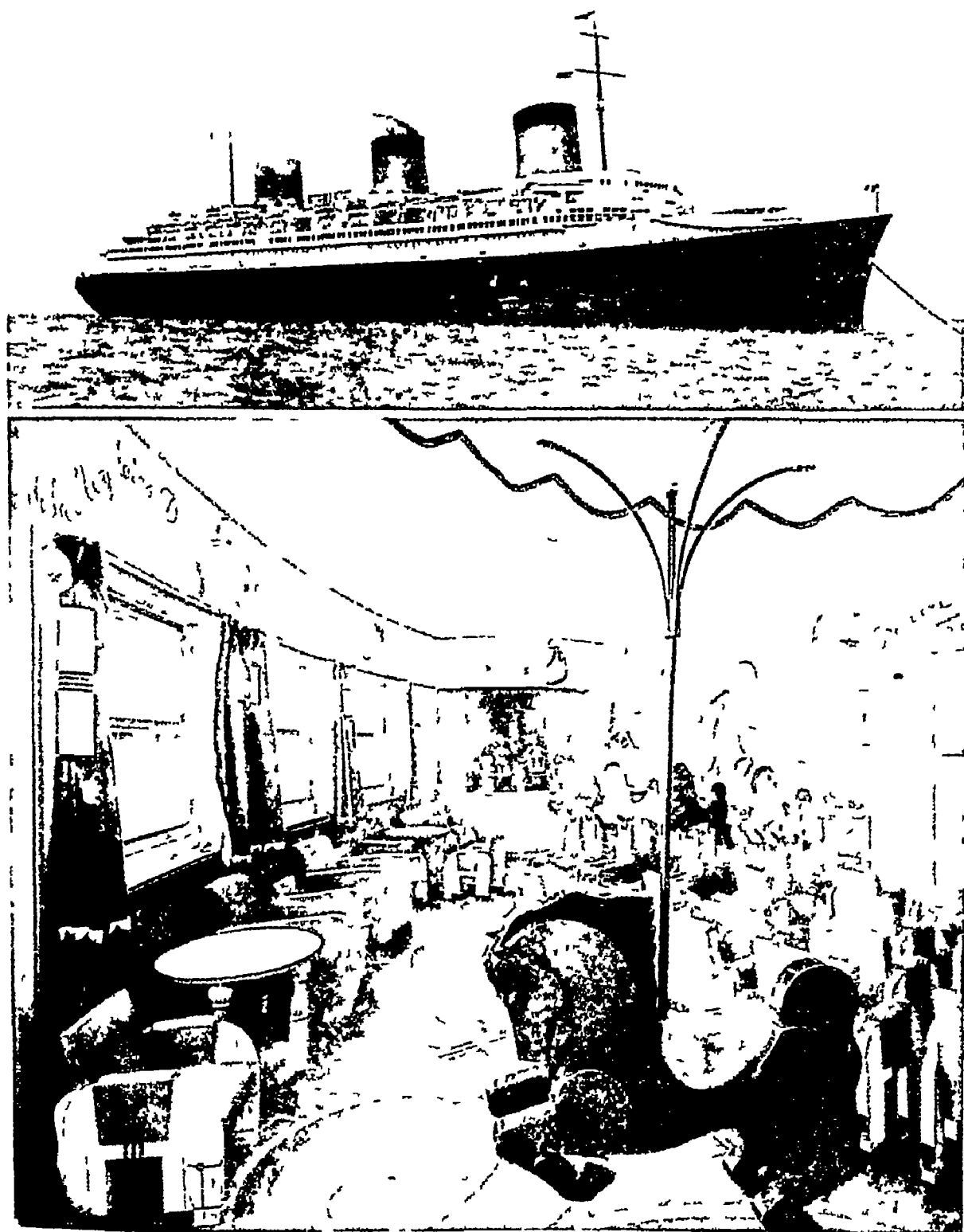
Of particular importance is the "collision bulkhead" in the bow, which is built especially strong to withstand a collision, confining the damage to that part of the ship if the bow should be stove in. The doors in the bulkheads are watertight and provided with closing apparatus electrically controlled from several central stations, so that any or all can be closed by pushing a button.

'Finishing Off'—the Last Process

When the construction of the hull has proceeded a certain length, plumbers, joiners, electricians and other craftsmen get to work inside the ship, and you can then see the exterior and interior work of the mighty vessel proceeding simultaneously.

The launching of the vessel is a great event in the shipyard, and it is a fine sight to see the vessel glide into the water, to the accompaniment of the cheers and hurrahs of the workmen. Usually a ship is launched stern foremost, and the most careful calculations and precautions must be taken to ensure a safe launching.

PALATIAL FRENCH LINER ON ATLANTIC SERVICE



In the upper photograph is seen the 83,423 ton French liner *Normandie*, which was put into service on the Le Havre-New York route in 1935. On her maiden voyage she captured the Blue Riband of the Atlantic, breaking all records for transatlantic passenger ships on this route. On board a modern liner there is every amenity and the children are catered for no less than their parents. What child would not be enraptured by this enchanting playroom on the *Normandie*? The walls are covered with delightful paintings illustrating for the most part, popular French children's songs.

Photos by courtesy of French Lines

SHIPS & SHIPBUILDING

Very occasionally a small ship is launched broadside on. But the vessel is only half-completed even when the launch has been successfully accomplished. Little more than the hull of the vessel has been built on the slips, and after the vessel has taken the water and has been brought safely to its moorings, the engines and boilers, and all the internal fittings have to be installed.

For many months the ship is a busy workshop, within which hundreds of artisans and skilled craftsmen are employed. Or, to put it in another way, the newly-launched hull becomes the site upon which is built, storey by storey, a huge and magnificent hotel! For nowadays an Atlantic liner is no longer regarded simply as a means of conveyance across the ocean, in which some discomfort is inevitable, but as a floating palace, beautiful and luxurious.

Nothing could be more striking than the contrast between the enormous vessels which the modern shipyards turn out for the transatlantic service and the vessels of the past. The first Cunarders of 1840, for example, were wooden paddle steamers 200 feet in length, with a speed of a little over 8 knots. The Queen Mary is 1,018 feet long, and in August 1938 set

up a new transatlantic record in each direction—3 d 21 h east to west and 3 d 20 h 42 m for the return voyage.

The difference in the interior appointments of the best ships built in British shipyards today, and the comfortless boats which crossed the ocean in the middle of the past century, is even more striking than that afforded by the improvement in size and speed. Nowadays a liner must not be inferior in luxury and beautiful furnishings to the best hotels ashore.

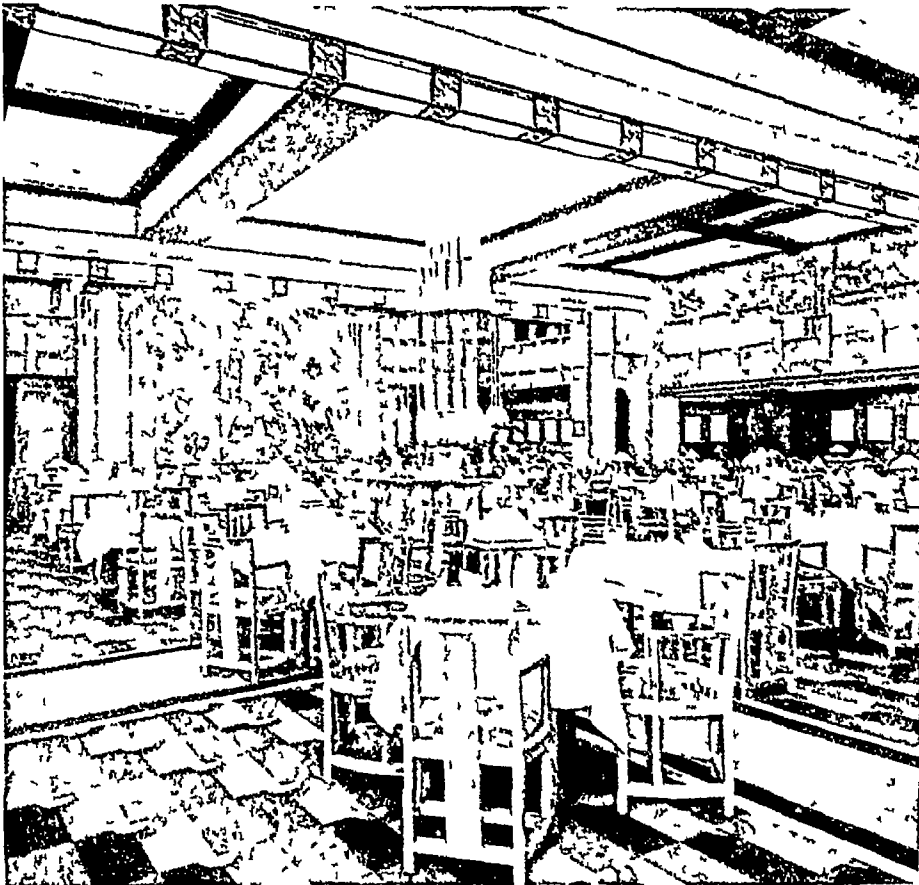
Magnificence of Interior Decoration

The interiors of many modern liners are decorated in "Period" styles. For example, the dining saloon of one great ship is oak-panelled to resemble a baronial hall of great age, with a minstrels' gallery at one end, and a low-relief plastered ceiling, which is a faithful reproduction of the Jacobean period. Eminent artists such as Sir John Lavery and Frank Brangwyn designed rooms in the Empress of Britain.

The smoking-room of another luxury liner is of the Jacobean period, with a magnificent oak staircase and a chimney-piece copied from a celebrated example at Old Place, Lindfield, Sussex. In the library the bookcases are copies of those in the Pepysian Library at Magdalene College,

Cambridge, the lounge is in the style of the royal apartments at Hampton Court Palace, while the card-room is a splendid reproduction of the decorative art of the brothers Adam. The interior furnishings, fittings, and decorations of such ships are entrusted to outside firms and artists.

The advances made in shipbuilding since the *Sirius* of 1838 are marvellous. It is difficult to say whether the ships built a century hence will surpass the great liners of today to the same extent as the Queen Elizabeth has surpassed the first Cunarder, *Britannia*, of 1840 (*See also* Boats and Yachts, Buoys, Lighthouses and Lightships, Mercantile Marine, Navigation, and Navy).



DINING SALOON ON A MODERN LINER

The interior decoration of modern liners is comparable to that of the finest hotels ashore, as you can see for yourself by looking at this photograph of a dining-room on the *Empress of Britain*. This hall, with its fine mural decorations and elaborate lighting, is called the *Salle Jacques Cartier*, after the French navigator who discovered the river St. Lawrence.

Canadian Pacific Photograph

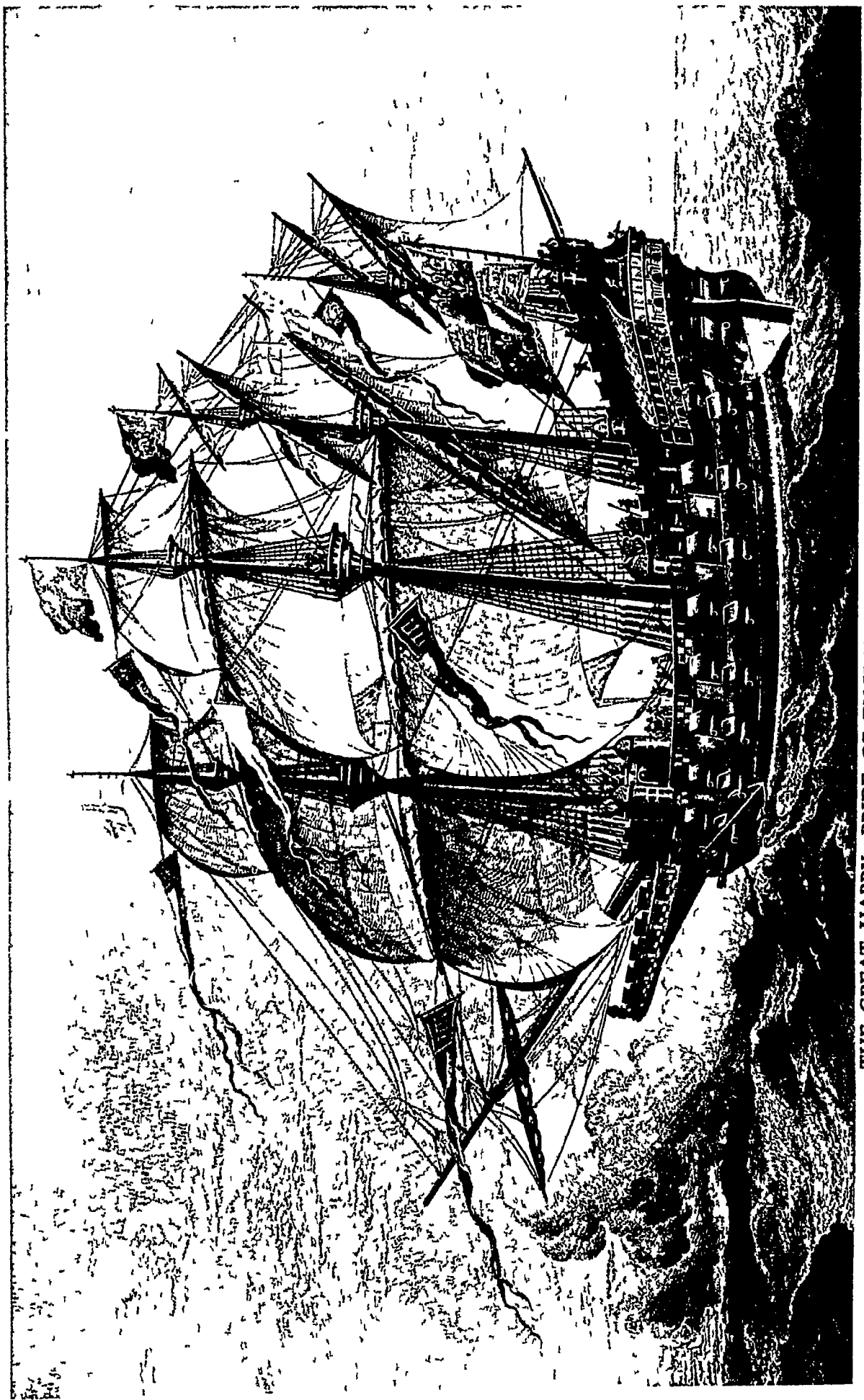
SHIPS THAT HAVE MADE SEA HISTORY



Sailing ships have practically disappeared from British waters except for the Thames barges which navigate the Thames estuary and serve the nearer ports. These sturdily built ships each manned by a crew of two or three men will probably be the last of British sailing ships. This photograph shows such a barge in the Thames estuary. She is running before the wind with her mainsail and mizzen set. With her sprit sail rig she makes a curious contrast to the ocean-going liner the sailing yacht and the motor boat in the background.

For Photos

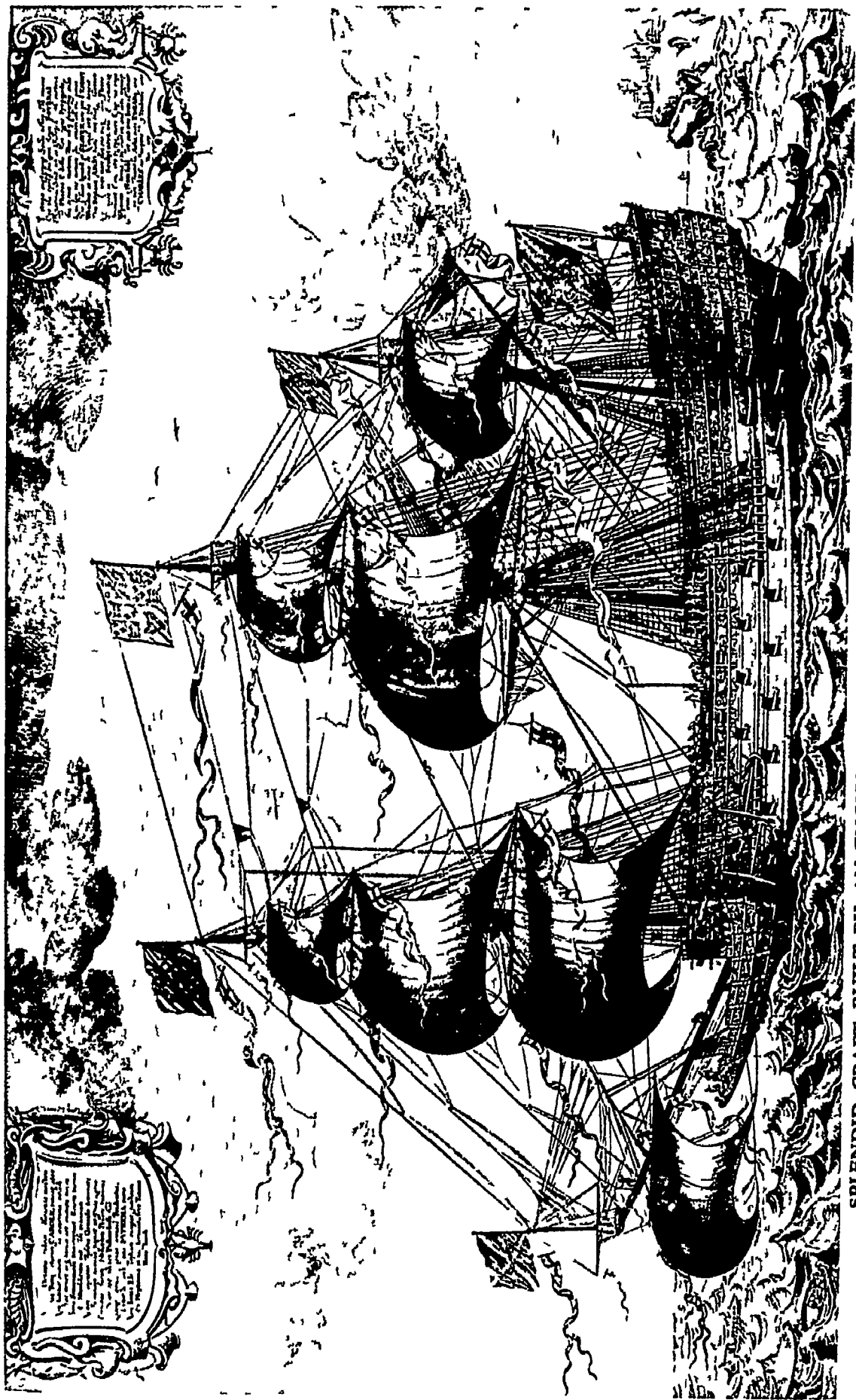
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THE GREAT HARRY PRIDE OF ENGLAND'S NAVY IN TUDOR TIMES

The earliest triumph of British shipbuilders in great ships was the Great Harry, built in 1514 by the order of Henry VIII at a cost of £14,000. She was the first double-decked ship constructed in England and for her period was of great size being of 1,000 tons burthen. She represented a great advance on previous ship design but still retained on poop and bow the castle-like superstructure of earlier ships—her fore-castle as can be seen in this engraving having battlements and turrets.

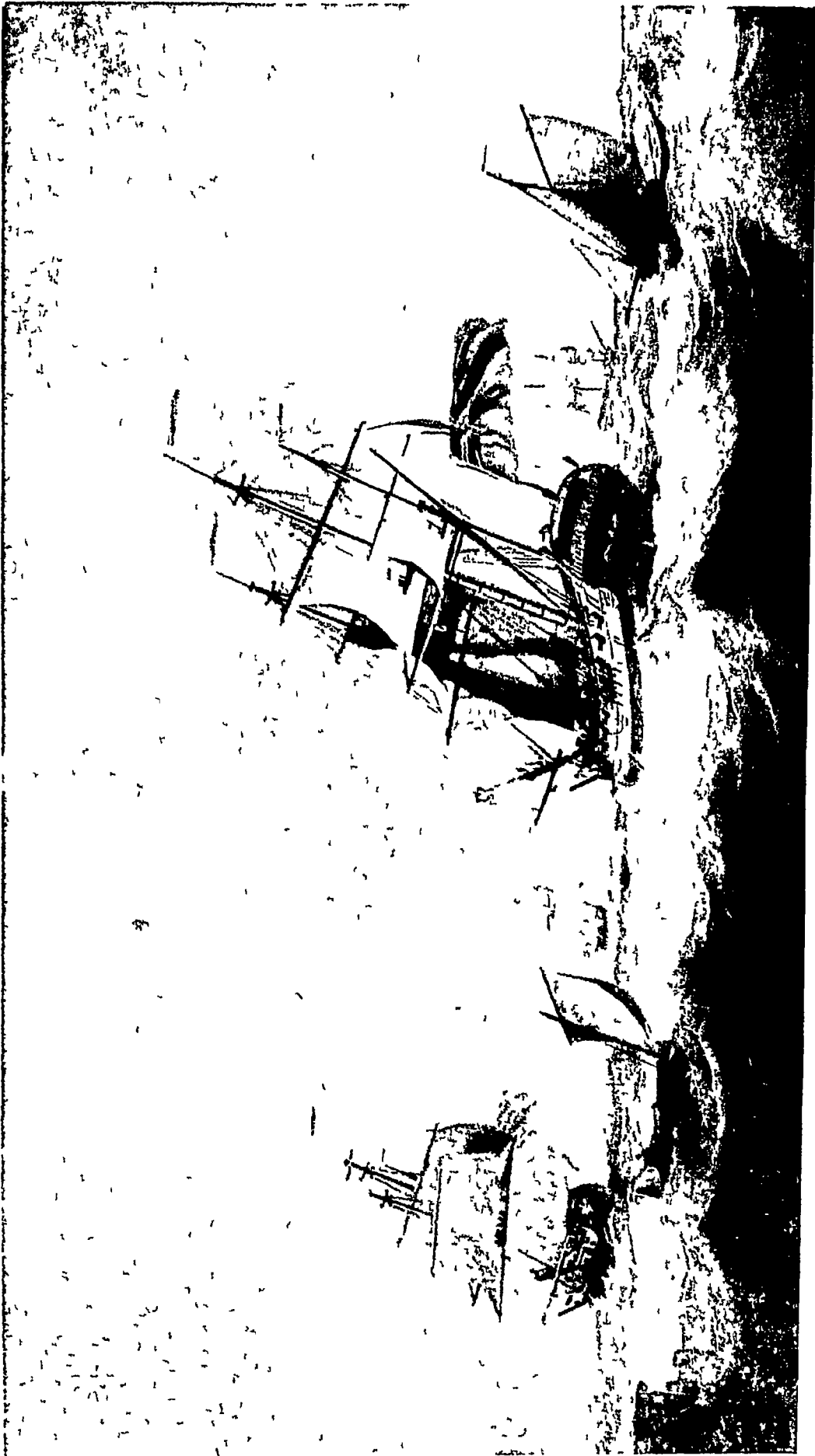
From an engraving by J. C. Canot after a painting attributed to Holbein



SPLENDID CRAFT BUILT BY AN ENGLISH SHIPBUILDER OF THE SEVENTEENTH CENTURY

A hundred and twenty years after the building of the Great Harry seen in the opposite page another step forward in the history of ships was made when the Sovereign of the Seas was built for Charles I out of the proceeds of Ship Money. She was the first ship to have three decks fully armed and was built by Peter Pett from the designs of his father Phineas Pett one of the world's most famous architects. She was the most elaborately ornamented ship ever built for the Navy

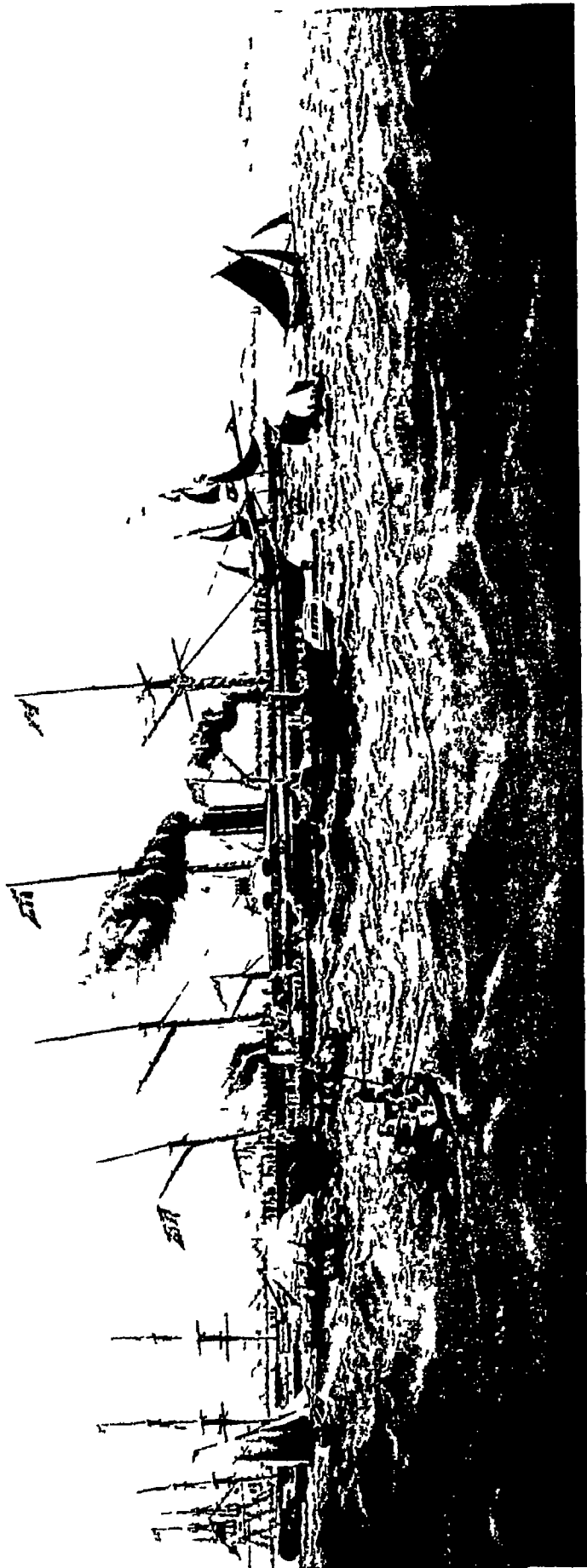
From the engraving by J. Payne founded on the designs of Peter Pett



STOUT SHIPS OF THE EAST INDIA COMPANY'S FAMOUS FLEET IN THE CHANNEL

The earliest of the 'crack ships' in the British Mercantile Marine were the East Indiamen, the fleet of sailing ships which in the days of the old East India Company carried passengers and cargo to and from India. This painting shows one of the East Indiamen of the middle of the 18th century close hauled in a fresh breeze. Indiamen were armed with guns on the upper deck, for they had to be prepared to defend themselves not only against the king's enemies, but against pirates, on their long and perilous voyage to the East round the Cape of Good Hope. In the picture the two stern galleries can be seen and there was a large stateroom aft for passengers. East Indiamen were the most famous ships of the Mercantile Marine until the middle of the 19th century. The illustration is from a painting by Charles Brooking, a well-known 18th-century marine painter.

By permission of the Trustees of the National Maritime Museum, Greenwich

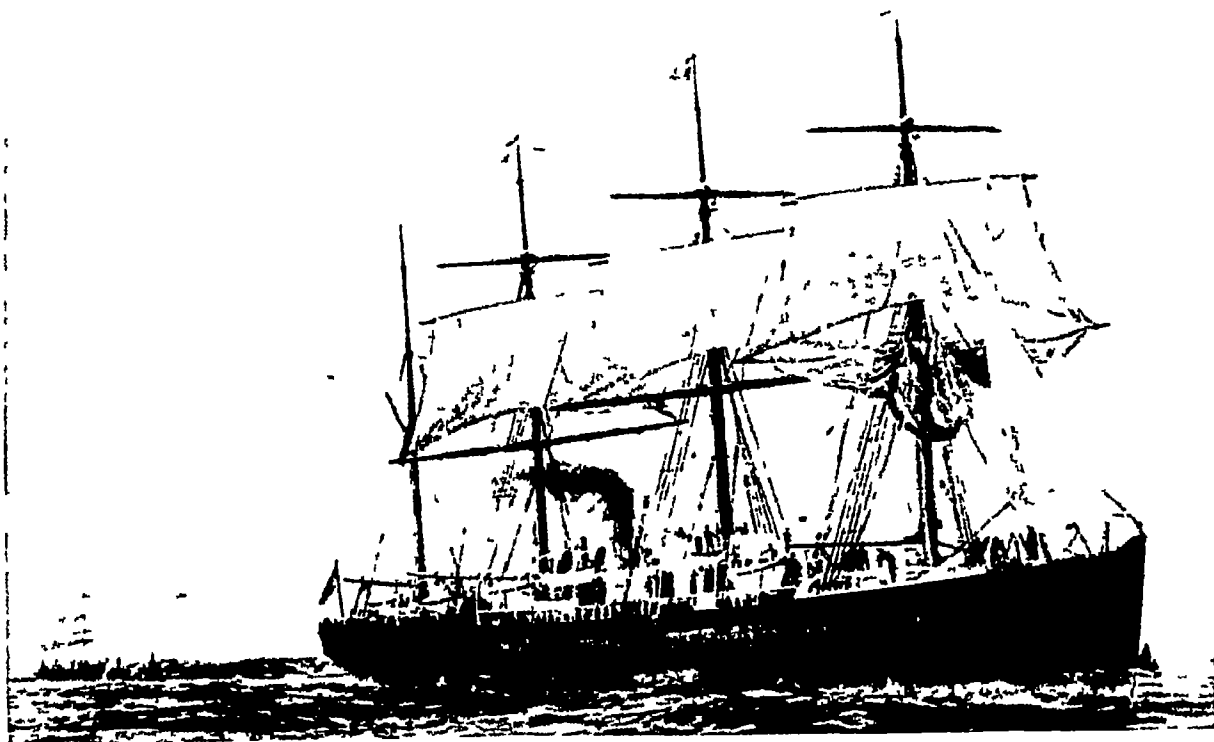
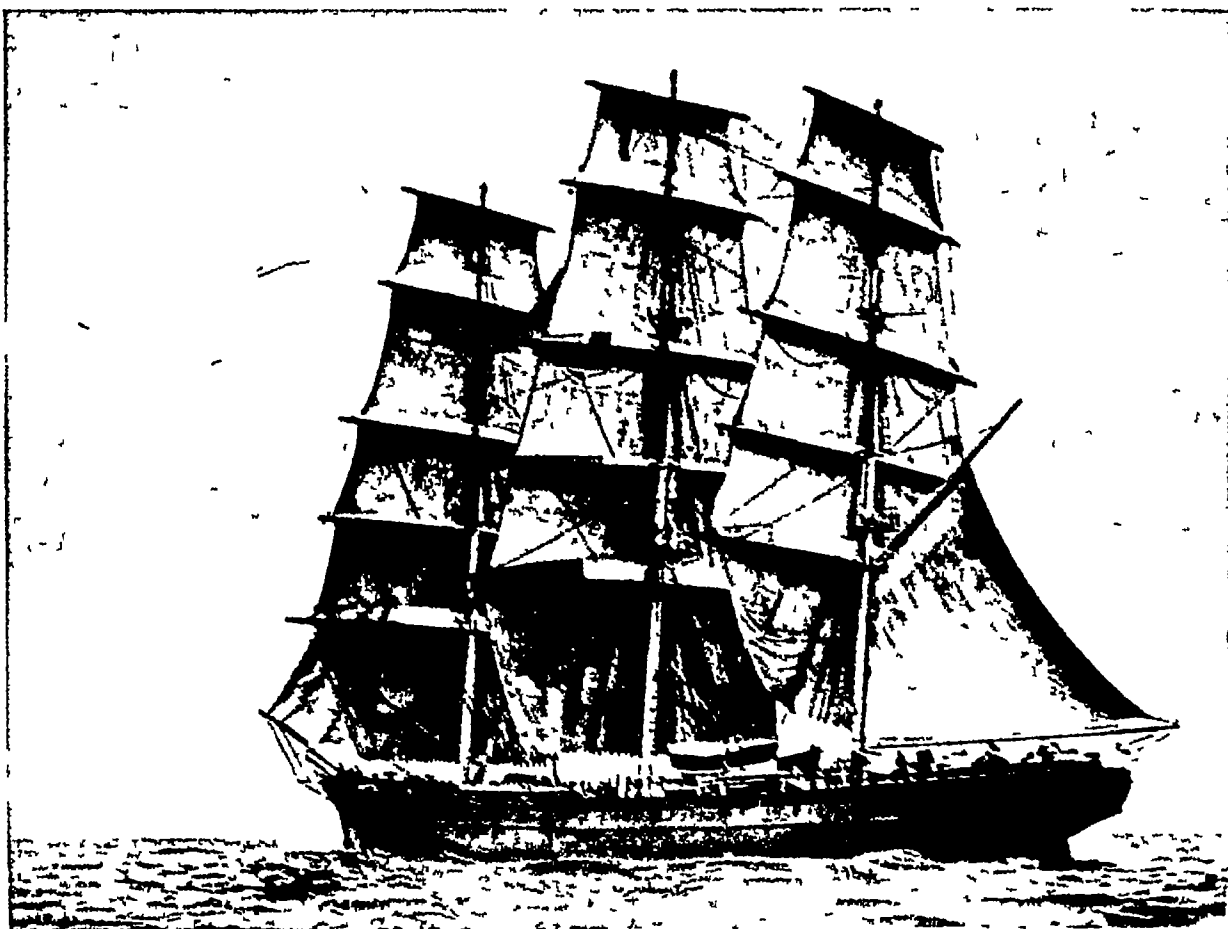


THE FIRST OF THE FAR-FAMED ATLANTIC LINERS SETS SAIL FOR NEW YORK

In April 1938 the centenary of the crossing of the Atlantic by steam was celebrated. The first steamship actually to cross was the *Sirius* originally built as a cross-Channel steamer (see illustration page 3676) but she was followed a few days later by the *Great Western* a vessel of 1 340 tons and 740 h p built expressly to prove the possibility of a regular transatlantic steamship service. The *Great Western* is here seen leaving Bristol on her first voyage to New York. She was designed by the great engineer Isambard Kingdom Brunel and like all early steamships was propelled by paddle-wheels. She continued in the transatlantic service for nine years and her best records were 14 days on the outward and 13½ days on the homeward voyage.

From a print in the Science Museum, South Kensington

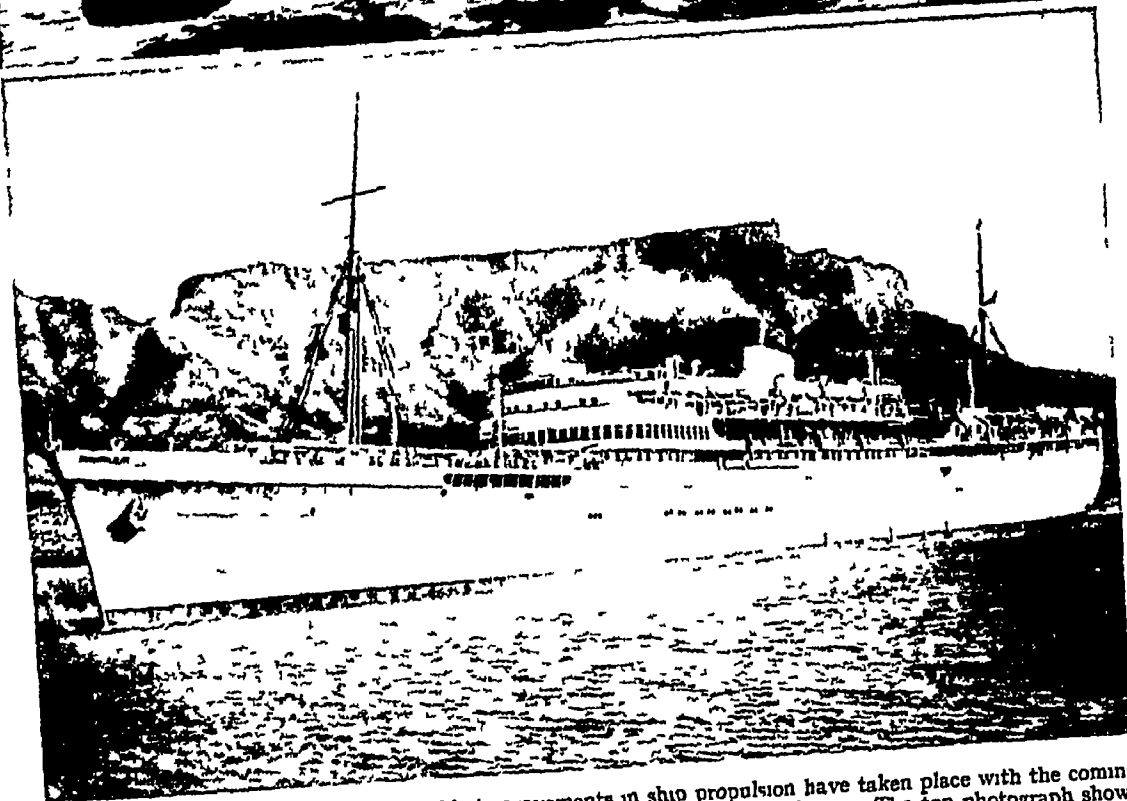
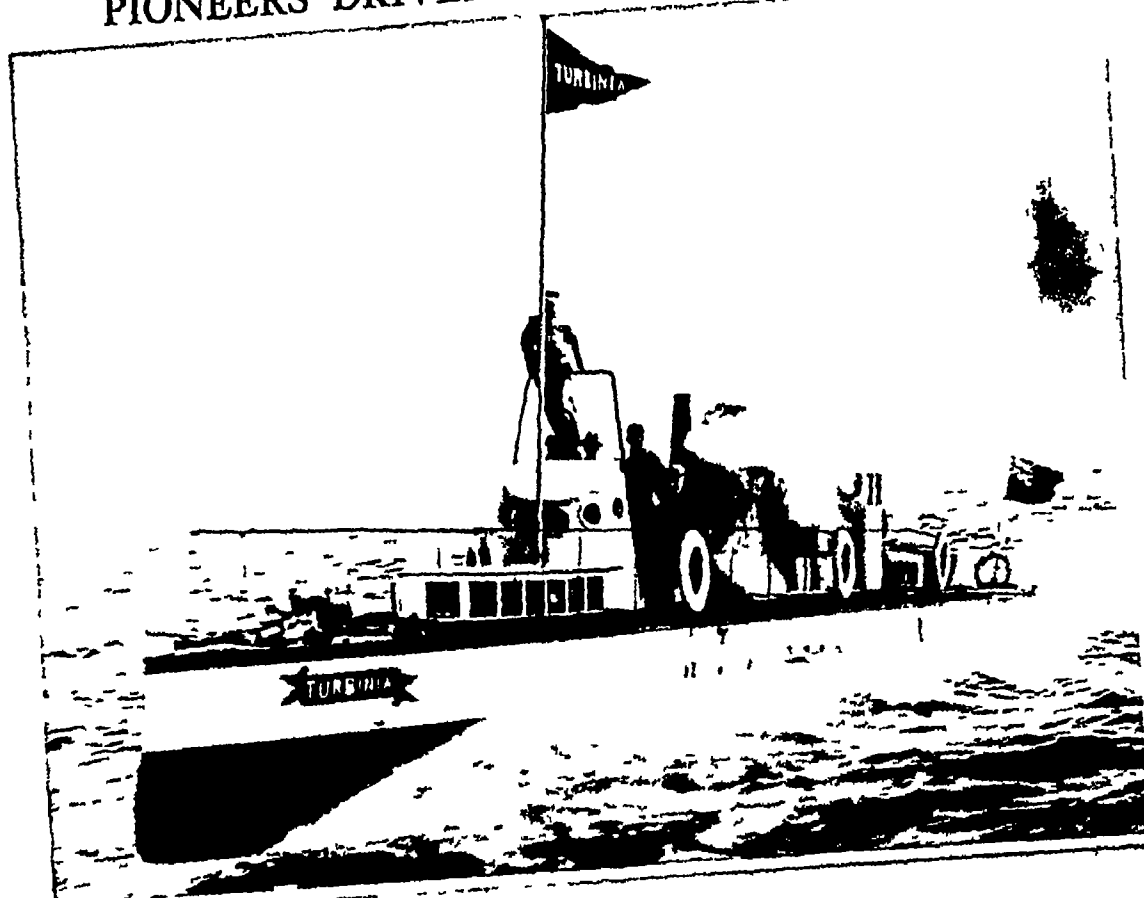
THE PASSING OF SAIL, THE COMING OF STEAM



In middle years of the 19th century the British Mercantile Marine began the gradual change from sail to steam. The most famous sailing ships of those years were the clippers which brought home the tea crop from China. The top photograph, taken in 1886, shows one of them, the Cutty Sark (which still survives as a training ship), under sail. The lower photograph represents the transitional stage when steamships still carried sails to help them in a favourable breeze. The ship is the White Star liner Oceanic, a single screw steamer, built in 1870.

Photos: Nautical Photo Agency and courtesy of Cunard White Star Ltd

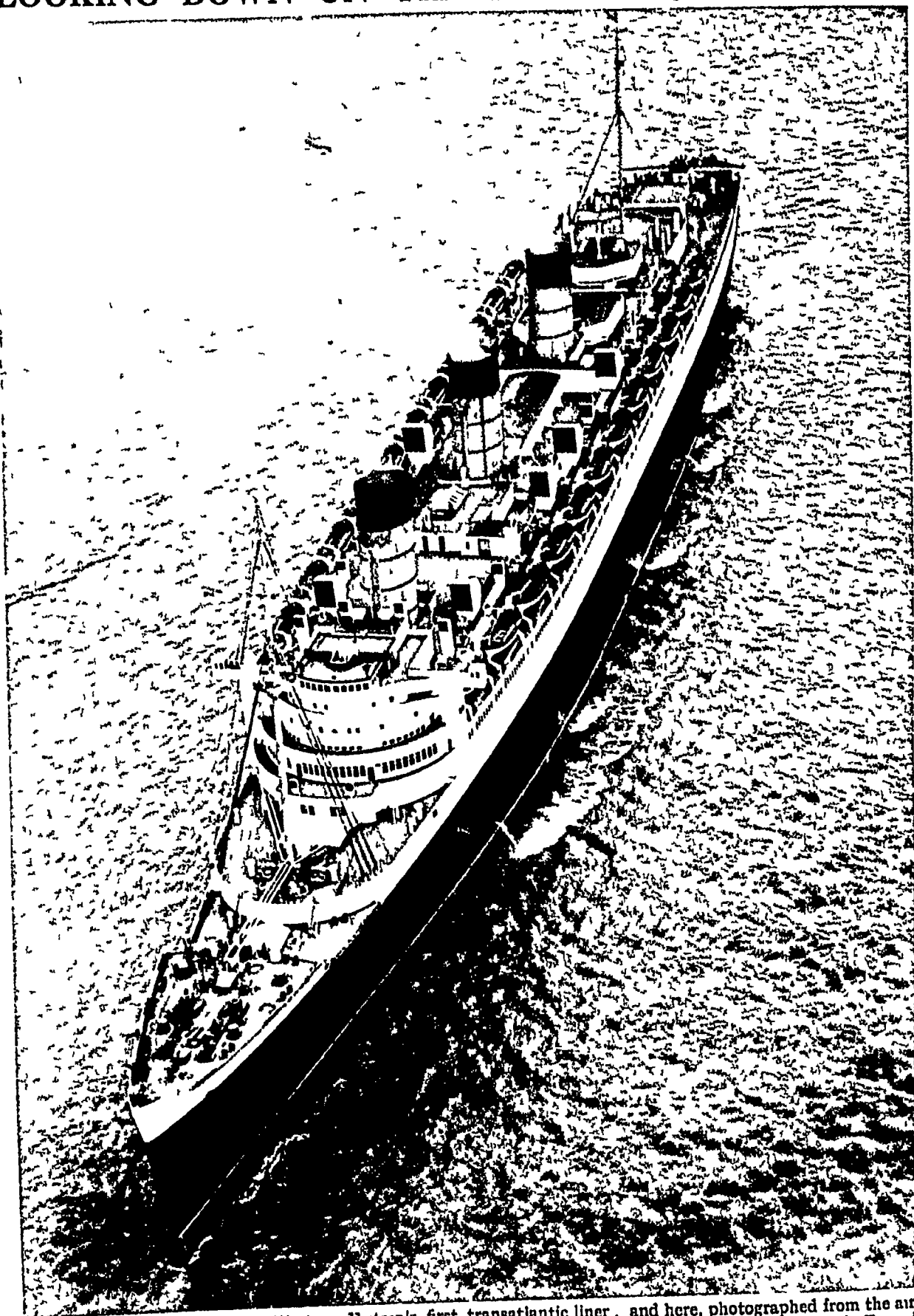
PIONEERS DRIVEN BY TURBINE AND OIL



During the present century two remarkable improvements in ship propulsion have taken place with the coming of the turbine and the employment of internal combustion engines in large liners. The top photograph shows the Turbinia, the small steamer which was the first to be driven by the Parsons steam turbine. She is seen on her trials on the Clyde when she attained a speed of 35 knots. Below is the Union Castle liner Stirling Castle. This 25 500 ton vessel fitted with Diesel oil engines makes the voyage between London and Cape Town in 14 days.

Courtesy of the Director of the Science Museum, Parsons Marine Steam Turbine Co. and the Union Castle Mail Steamship Co.

LOOKING DOWN ON THE MIGHTY QUEEN MARY



In page 3693 is seen the Great Western, Britain's first transatlantic liner, and here, photographed from the air, is the Queen Mary, Britain's latest addition to the great fleet of liners which have made the "Atlantic Ferry" the most famous sea service in the world. The Queen Mary is of 81,235 gross tonnage—nearly double the size of the Aquitania, previously the largest British-built ship—and her engines develop 200,000 horse-power, giving her a speed equal to 38 land miles an hour. She can accommodate 2,139 passengers and carries a crew of 1,101.

For Photos

Shooting. Whether you take up shooting for the sake of the sport or for more serious reasons, you will need to acquire perfectly steady nerves, combined with physical fitness, so that in all situations you will never become flurried, but take a steady aim, with correctly aligned sights, instinctively using the correct actions of loading, aiming, and trigger pressing.

In shooting game for sport or pleasure, shot-guns are used. These are usually double-barrelled: one of the barrels is bored parallel throughout, the other tapered towards the muzzle (choke-bored) in order to increase its range and decrease the spread of the small lead pellets or shot. A loaded shot gun should be carried with the trigger guard uppermost.

The correct position in which to stand when firing, the method of shooting flying game so as to judge on the instant the exact spot where the charge and animal will come into contact, the manner of changing guns with the man who is loading, and all the intricacies of the science of shooting, can only be acquired by actual practice and demonstration.

The service rifle (*see* Firearms) has one barrel and fires a single bullet which is caused to rotate during its passage through the barrel by the cork-screw groove or 'rifling' inside. This rotation is maintained during the bullet's flight and increases the accuracy of the shot. To learn to become a successful rifle shot needs much practice. You should learn to load by using a set of dummy rounds, and aiming may be learnt anywhere with the rifle unloaded. Whether you stand, kneel, or lie down you will have to learn to do it really comfortably with the maximum of stability.

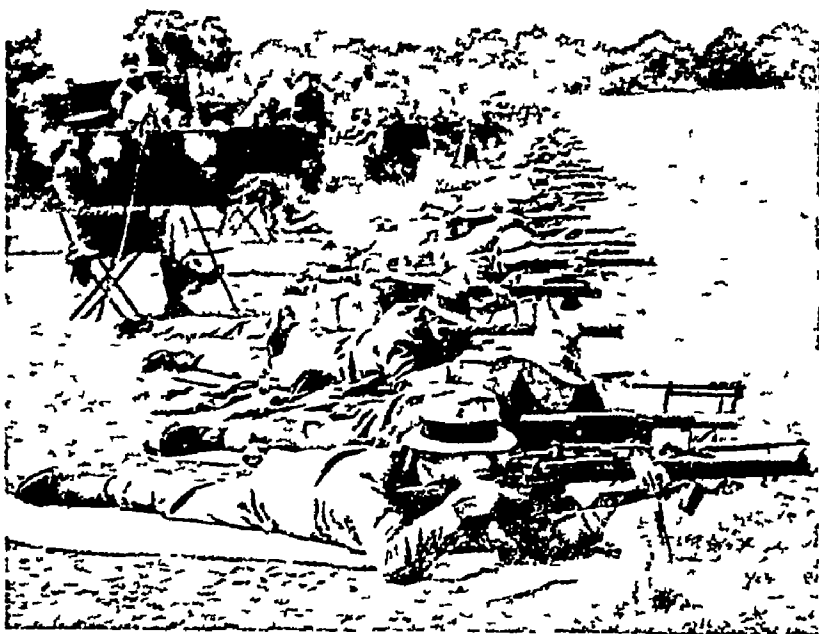
The three rules of aiming are (1) close the disengaged eye, (2) keep the sights upright, and (3) keep the tip of the blade of the fore-sight in the centre of, and in line with, the top of the shoulders of the U of the back sight, at the same time training it on the lowest centre portion of the mark. Allowance must also be made for a cross wind, by sliding the wind gauge two or three "clicks" to the left or right. The rifle is fired with the trigger finger (forefinger), exerting not a jerk but a gradually increasing pressure, which will fire the rifle without disturbing the aim. The trigger must never be "pulled," for this will result in the shot being deflected to the right.

Your first practice with a loaded weapon should be made on a bull's eye target, five shots being fired with exactly the same aim for each. If all the rules have been observed the shots will be close together in a "group." You must also practise 'rapid firing'—firing a number of shots in a given space of time. 'Snapping' is done on a target which is exposed to view for a few seconds and then lowered.

Rifle shooting, with its headquarters at Bisley, Surrey, is a sport with thousands of devotees all over the country, the governing body being the National Rifle Association. At the annual meeting at Bisley all the most important events are decided—such as the King's Prize, open to past or present members of H.M. Forces, or those of any British Protected State, and the Ashburton Shield, open to teams of eight from the public schools (*see* Artillery, Explosives, Machine guns).

Shorthand. A very rapid writer of long hand (that is, ordinary writing) can reach a speed of about 60 words a minute. By the use of shorthand, however, one who has just mastered the art can usually write 100 words a minute, and expert shorthand writers have made records of more than 250 words a minute—over four a second! The average public speaker, it has been estimated, speaks at the rate of only 120 to 150 words a minute, and usually a business man in dictating speaks slowly enough for even a beginner to keep pace with him.

Forms of shorthand have been in use since very early times. The orations of Cicero were



RIFLE SHOOTING ON THE BUTTS AT BISLEY

Bisley is a tiny parish of less than a thousand souls, in the county of Surrey but its name leaps into prominence every year owing to the fact that since 1890 the National Rifle Association have held their annual meeting in July at the ranges on Bisley Common. Above is a general view of the St. George's Consolation shoot.

taken down in some sort of shorthand by his freedman, Tiro, and for a long time these so-called Tironian Notes were used

England is the birthplace of modern shorthand. From the 16th century various systems have been used, but it was not until Isaac Pitman in 1837 published the first work on "phonography," or writing by sound, that shorthand became a practical art. Of the several systems which are in general use today, most are based on that of Pitman, who was later knighted. An exception is Gregg shorthand, a system invented by John R. Gregg, and published in England in 1888.

Modern shorthand uses as few strokes as possible to a word, the average number in the practical systems of today being from two to three. The shorthand alphabet includes distinct characters for the representation of consonants, vowels, and diphthongs. Various methods of abbreviation are used, such as writing the most suggestive part of a word instead of the complete outline, using "word-signs," often consisting of a single stroke, for a large number of common words, and using short methods of writing prefixes and suffixes, such as *con*, *inter*, *tion* (*shun*), etc. Another expedient for gaining speed is "phrasing," or uniting two or more words in one outline.

The Pitman system uses "position writing," an expedient for expressing vowel sounds without writing them, the principal vowel sound in each word is indicated by the position in which the outline is written—whether above, on, or through the line. The Gregg system abolishes position writing by writing the vowel into the word in its regular order, without lifting the pencil, thus it may be legibly written on unlined paper. Another feature of Pitman shorthand is "shading," the heavy writing of an outline giving a meaning different from that of the same outline written lightly.

The consonant alphabet of the Pitman system consists of straight lines and circular curves, that of the Gregg, of straight lines and elliptic curves. Where it is necessary to express vowels in the Pitman system, dots and dashes are used, and diphthongs are represented by acute angles pointing in various directions. The Gregg system uses what are called connective vowels—circles and hooks

joined to the consonants in the order in which they occur in the word represented, and diphthongs are composed of combinations of circles and hooks. This tends to make the system elastic.

In the last quarter of the 19th century machines for writing shorthand began to appear. Several of these, such as the stenograph and the stenotype, have proved practicable and are extensively used. They are constructed so that all the keys may be depressed at the same time, and a code has been developed so that a whole word may be written at one stroke.

To become a qualified shorthand-typist or stenographer a course of training at a good commercial school is usual. Shorthand, typing, duplicating, book-keeping and general office work are included in the course, and sometimes

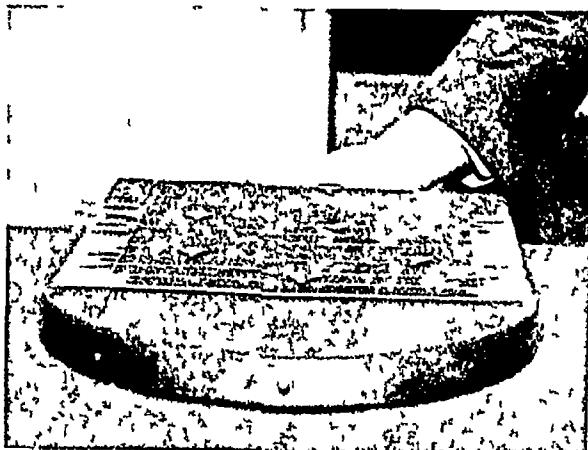
spelling, a very necessary subject for the prospective typist. This course lasts usually six months and should be taken on leaving school. A good general education in a secondary school is essential for the better positions. Pupils are also taken for individual tuition in a great number of typewriting offices. A trained typist should be able to maintain an average speed of not less than 40 words a minute, and some reach 60 words.

Shove ha'penny.

This is a game that

needs very much more skill and practice than at first appears, and from which much entertainment may be gained. The shove ha'penny board is marked off into nine equal "beds," and halfpennies or (more commonly) special disks of halfpenny size are "shoved" from the edge of the board into the beds by striking them gently with the ball of the thumb or other part of the palm. The object of the game is to get three disks in each of the beds without overlapping any other bed or disk. Each player in turn has five consecutive "shoves" and then marks his score with chalk on the edge of the board. Should a player score more than three in any bed, his extra points may be forfeited to his opponent, and marked up to him on that bed.

Shrike. Another name for this bird is "butcher-bird," because of its peculiar habit of impaling its victims—be they insects, mice, or other small birds—on the thorns of the hedges or on sharp twigs. They are then held



THE SHOVE HA'PENNY BOARD

In this popular game, as seen here, the halfpenny or disk is "shoved" with the ball of the thumb, or some other part of the palm, so that it comes to rest in one of the nine "beds," into which the board is divided.



RED BACKED SHRIKE

In spite of the fact that it is one of our most handsome birds the red-backed shrike is not very popular for it lives on other smaller birds, as well as small mammals, insects, etc. Here a female of the species is sitting on the edge of her nest, situated as usual in a tall thorn tree

steady so that the shrike can tear them to pieces more easily for its small weak feet are not adapted for grasping large objects. This is, therefore, a bird that has taken to preying on other animals, though it is no relative of the true birds of prey, but is more closely connected with the finches and other song birds.

The red backed shrike (*Lanius collurio*), our British species, may often be seen in southern England, sitting on the top of some wayside bush or on the telegraph wires, balancing itself by means of its long, black-barred tail. It is of rather heavy build, and the cock is a handsome fellow, his red brown back and the black stripe across his eye attracting one's attention at once. The hen, however, is dull brown, with paler streaks and speckles on the breast. This shrike constructs a flat, flimsy nest in a thick thorn bush or low tree, and lays grey, thickly spotted eggs late in the season for it is only a summer visitor to Britain.

Another shrike we sometimes see as a rare visitor is the great grey shrike (*L. excubitor*), a much larger, grey, black and white bird which breeds on the Continent of Europe. Shrikes are also found throughout the Northern Hemisphere and in parts of Africa and India.

Shrimp. Shrimps, of which there are many varieties, belong to the crustacean group, and indeed it needs only a glance to see that they are very like tiny lobsters, to which they are related. The common shrimp, *Crangon vulgaris*, is from 2 to 3 inches long and has tiny paddle like legs for swimming, long delicate

feelers on the head, and a funny little hump backed, green grey body speckled with brown that ends in a diminutive tail. Shrimps dwell in pools left by the tide, or bury themselves in the sand, and are caught either with a push net or a trawl net. The flavour of their tender flesh makes them a highly prized table delicacy. When boiled, they turn brown.

Prawns are big cousins of the shrimp. They grow to be 5 inches long, in the tropics even reaching a length of 20 inches. The flesh turns a pink colour when cooked.

Shropshire, ENGLISH Co. With an area of 1,346 square miles, Shropshire (Salop) is mainly an agricultural county—barley, oats and wheat being the chief crops. Cattle are reared, and the Shropshire breed of sheep is famous. The neighbourhood of Coalbrookdale is a coal-mining centre. Coalport has a china factory, and there are tile and brick works.

The county town, on the Severn, is Shrewsbury (population, 32,000), where there is a famous public school, and from the ancient name of which comes the name Salop. Other towns are Ludlow, Oswestry, and Market Drayton. The population of the county is about 244,000.

The hill ranges comprise the Cleve and Breidden Hills and Wenlock Edge, and the Wrekin is an isolated peak. Rivers include the Severn and its tributaries and the Teme. The Shropshire countryside inspired A. E. Housman's book of poems "A Shropshire Lad" and Mary Webb's novels.

The old earthwork known as Offa's Dyke forms part of the county boundary. The Norman lords of Shropshire built a number of castles to defend their territories, the most famous being at Ludlow. Stokesay Castle is a magnificent example of the moated manor-house.

Siam (THAILAND) The sacred white elephant, whose image waved on Siam's red flag until 1918, is still found in the trackless mountain forests of that remote land, along with the tiger,



SHRIMPS ON THE SHORE

These two shrimps, lying partly on the sand, partly on the seaweed, are in a dangerous situation, if they were entirely on the sand they would be almost invisible. The shrimp is almost as delicious as its relative, the prawn.

the leopard, the wild cat, and the rhinoceros. Monkeys chatter in fear as they flee before monstrous pythons gliding from branch to branch. Peacocks make the sombre green depths seem yet more sombre in contrast with their vivid plumage. The black-haired brown-skinned natives, their teeth and lips stained red with betel-chewing, still hold to the ways of their forefathers, keeping their dead embalmed in great jars for months before cremation, marrying their boys at 17 and their girls at 14—mature ages as compared with India—dressing in single kilt-like garments hanging from the hips, eating their simple rations of rice and fish with their fingers, and getting their chief delight out of cock-fights and fish-fights.

But the ancient kingdom of Thailand, as other countries of the Orient, is fast being transformed by Western influence. Bangkok (*q v*), the capital, is a cosmopolitan city of the world, and even in many of the remote regions the natives count the cinema as one of their favourite diversions. The security of Thailand in late years is due to the fact that, like Afghanistan, it is a "buffer state" between colonial lands of two great

European Powers—British Burma on the west, and French Indo-China on the east. For centuries it was hampered by constant wars with native peoples on its loosely defined frontiers, but since 1896, when France and Great Britain guaranteed its independence and neutrality—leaving it the only independent nation of the Indo-Chinese peninsula—Thailand has been free to apply itself to internal development.

Extent—200,000 square miles **Population** 14,000,000
Physical Features—Mostly lowland, with dense forests. Mountainous country in Upper Siam, watered by Mekong and Menam.
Principal Products—Rice, rubber, coconuts, teakwood, tin and other minerals.
Chief Towns—Bangkok, capital (700,000), Chiangmai, Ayuthia.

Until 1932 the King of Siam ruled as an absolute monarch. As the result of a revolution in that year he granted a Constitution establishing a Senate and a Cabinet, with suffrage for both men and women. But in March 1935 King Prajadhipok abdicated the throne in protest against the undemocratic policies of the new government. He was succeeded by his nephew, the young Prince Ananda. With the aid of foreign advisers, roads and railways have been built and agriculture fostered. Instruction, once left to missionaries and the Buddhist priests, is now supervised by a government department of education, although most of the schools are still in the monasteries. Primary education is compulsory for both boys and girls to the age of 14.

The surface of Thailand (except a narrow strip of Lower Thailand that forms the northern part of the Malay Peninsula) is shaped much like a hand. The fat thumb, to the east, is a low plain of desert scrub and stunted forest, enclosed by hills and the river Mekong. In this plain 2,000,000 people, perhaps the poorest peasantry in the world, make a bare living. The fingers are the northern mountain ranges whose heavily forested slopes, worked by the sturdy hill tribes, produce the major part of the world's supply of teakwood, as well as ebony, rosewood, rattan and ironwood. The logs are floated down the Salween into Burma or to the port of Bangkok, on the Gulf of Thailand by way of the river Menam, "the mother of waters," which is to central Thailand what the Nile is to Egypt, serving as the chief trade route and covering the plains with fertile soil when it overflows its banks.



GROTESQUE GUARDIANS OF A THAI SANCTUARY

Religious ceremonies play a great part in Thai life, and the country has an enormous number of ancient temples, known as wats. Here, in Bangkok, the capital of Thailand, is the Wat Arun, with its profusely-adorned pyramidal tower. The entrance to the temple is guarded by these two terrifying figures.

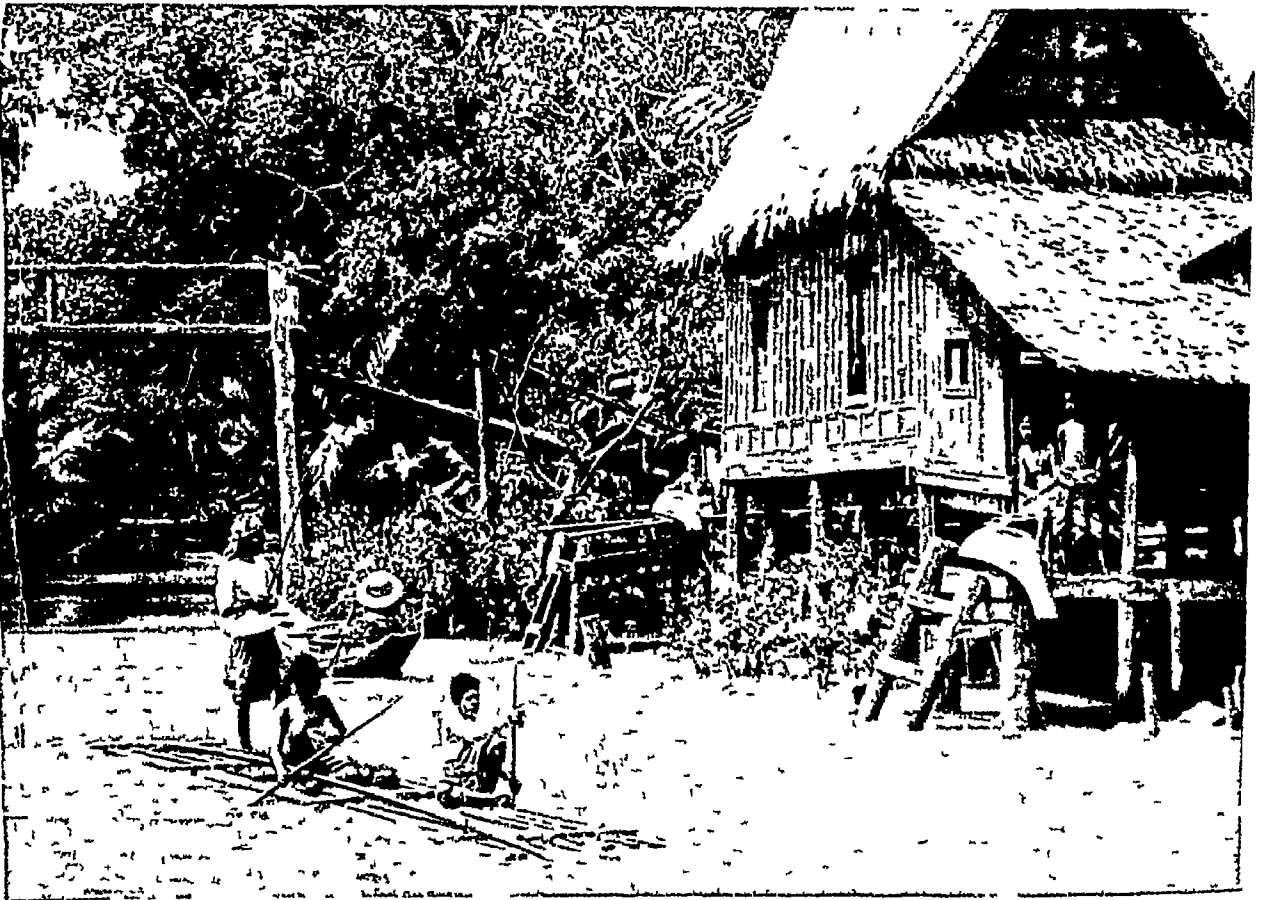
By courtesy of Aerial Transport Co. of Siam

'KING OF THE DEVILS'—THAILAND'S GOD OF DEATH



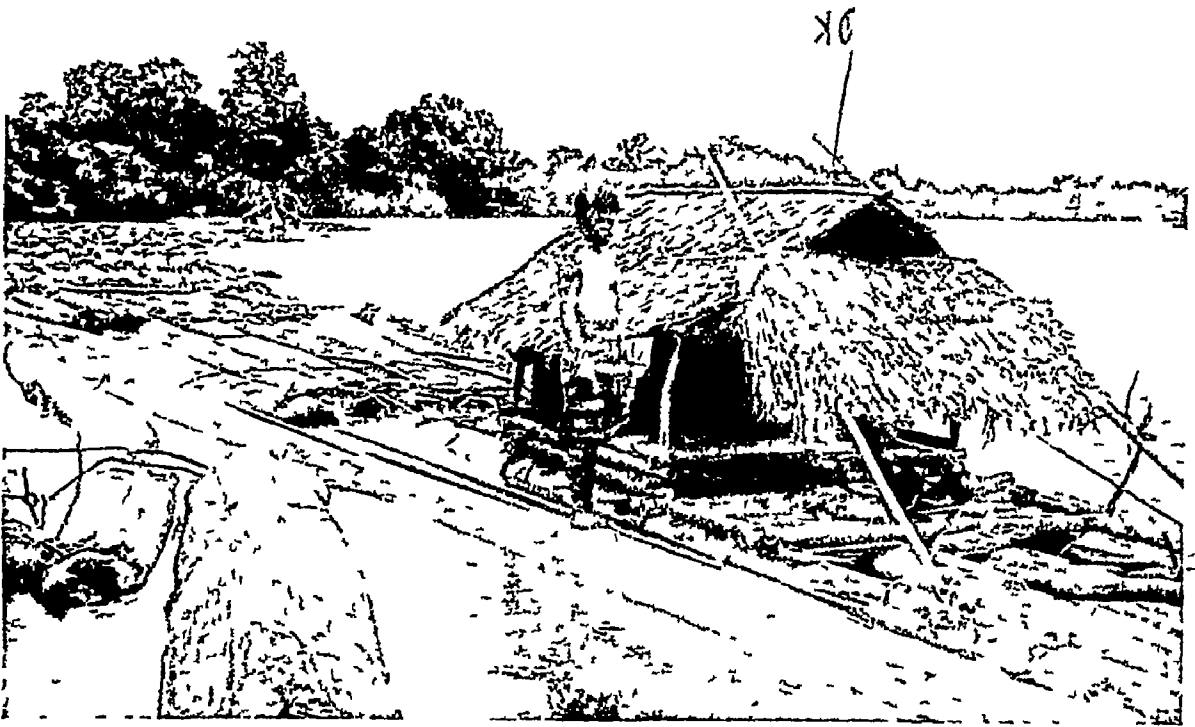
This great image is the Thai King of the Devils, Phya Yomraj. The Thai believe that entrance into heaven is difficult for the rich, and so the wealthy at various stages of their lives give away their surplus to the poor. As the guardian of the dead, Phya Yomraj has to be propitiated in this manner. In the case of old men, the performance of this ceremony may be looked upon in the nature of preparation for a more or less imminent passage to the next world.

TRAVEL BY LAND AND WATER IN ANCIENT THAILAND



elephants were once regarded in Thailand as the King's private property, and were allowed to roam at large, doing much damage to crops. Today many of them are captured and trained to bear howdahs, as seen in the upper photograph. The lower one shows children returning by raft to their home built upon piles, such houses line the waterways of Thailand, and in them, or even in homes in boats, lives a large proportion of the Thai population.

Photos top Ewing Galloway bottom Topical



SIGHTS OF THAILAND

Teak is plentiful in the forests of north Thailand, and the teak logs are floated out from the forests on the annual floods, as seen above, and rafted down to Bangkok. On the right is a detailed study of the head-dress of a Thai temple dancer

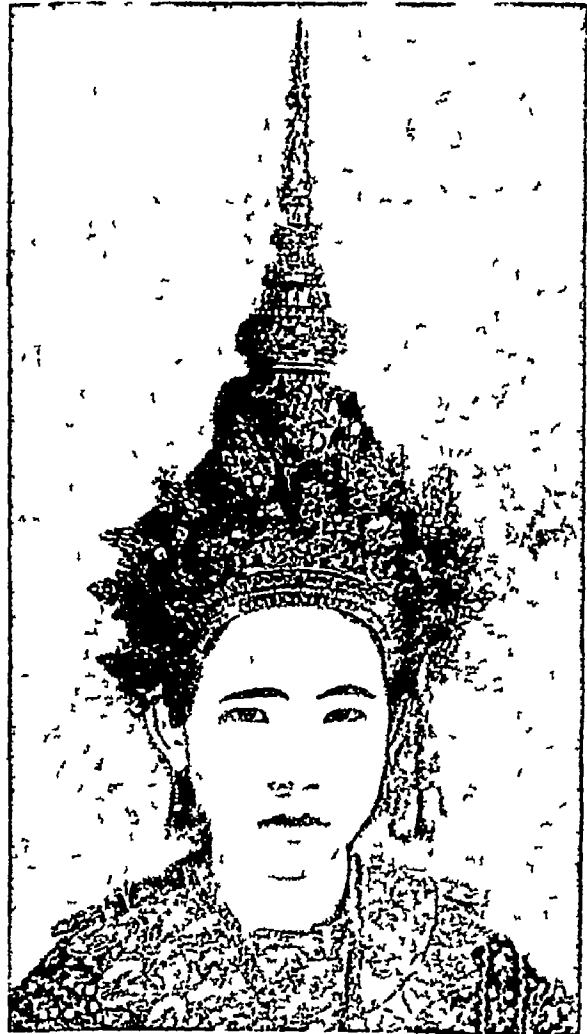
Photos Ewing Galloway

A network of east-to west canals links the farthest villages of this region with the Menam and two other large rivers, taking the place of roads and to a certain extent helping to irrigate the land. Irrigation is being undertaken on a large scale as part of the country's systematic programme of development. The modern State owned railway system is one of the most efficient in the East, and there are commercial air services of growing importance.

Rice is by far the most valuable product. Nearly the whole population outside Bangkok is engaged in growing "paddy," as unhusked rice is called in that part of the world. It is the staple food of the nation, and the chief export. Tin ore and teakwood rank next in importance. Thailand also exports rubber, cattle, salted fish, stick lac and other gums and resins, essential oils, skins, spices, and cardamoms, sapphires and rubies, bone and ivory. Besides tin, the mineral resources include wolfram, tungsten, coal, iron, zinc, manganese, antimony, and gold.

Three fourths of the foreign trade is with Great Britain and the British Empire, which every year, in return for Thailand's products, supply millions of pounds' worth of cotton goods, oil, silk, and machinery and other manufactures.

The population includes nearly 500,000 Chinese coolies and merchants. Some 10,000,000



are listed as "Thai," or Siamese. The rest of the population are Laos, Burmese, Cambodians, Malays, and Annamites, hardly distinguishable from the Siamese. The Thai are short and stocky, with their eyes slightly slanted. They are Buddhists, and closely resemble their Burmese neighbours in having a passive temperament, and giving their women much freedom. There is no caste system of the kind that is the curse of India. As in Burma, there are numerous Buddhist monasteries, and the temples of teak with gilded roofs resemble those of Burma in symmetry, but the people are not so industrious as the Burmese.

The term "Siamese twins," applied to twins joined together at birth, is derived from the first and most famous of such pairs—Chang and Eng (1811–1874), who were born in Siam and exhibited all over the world.

In 1939 Siam was officially re named Thailand.

Sibelius, JEAN (born 1865) Born at Tavastehus, Finland, on December 8, 1865, he studied at the musical Conservatoire there, and later at Berlin and Vienna. He became a teacher of the violin and of composition at the Helsingfors Conservatoire in 1893, and soon won such recognition that in 1897 he was given a life pension by the Finnish Government and there after devoted himself to composing.

Sibelius won an enormous reputation in his own country, the musical art of which he raised to a level never before surpassed, and by many European critics was also acclaimed as perhaps the greatest of contemporary composers. His highly individual work included much popular music such as the orchestral pieces "Valse Triste" and "Finlandia", he also composed many songs, much chamber music, and a number of operas. His eight symphonies were all received with high praise.

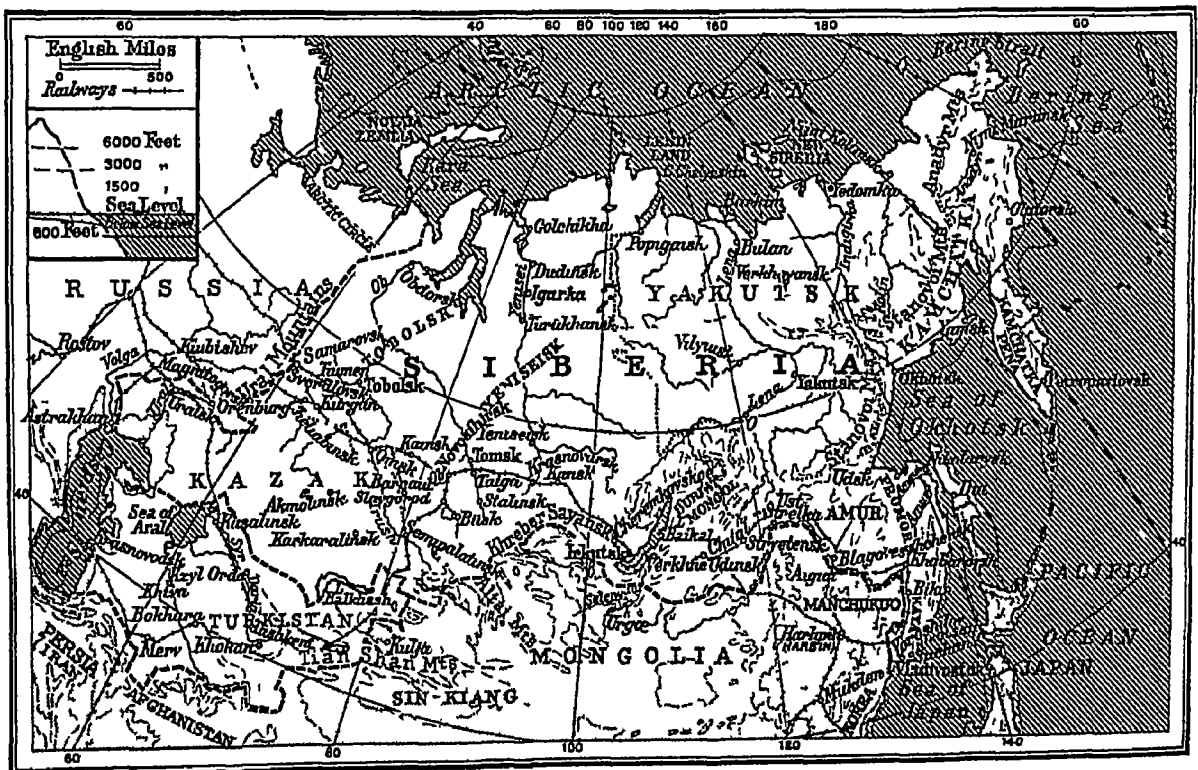
SOVIET RUSSIA'S REPUBLICS in ASIA

Until recently considered of little account, Russia's Asiatic lands give promise of almost unlimited supplies of raw materials. Four times the area of European Russia, Siberia seems about to become equally valuable.

Siberia. Stretching from the Ural Mountains boundary of Europe to the Pacific Ocean, and from the populous lands of Central Asia to the Arctic Ocean, Siberia's lonely steppes, forests, and frozen tundras exceed in extent the whole of the continent of Europe, covering an area of nearly 5,000,000 square miles.

In 1580 the victories of the Cossack bandit,

Yermak, over Tartar tribes east of the Urals opened Siberia to Russian occupation. Gold hunters, trappers, fur traders, escaped serfs, and, later, transported criminals supplied the elements of a natural and peaceable expansion. Yet at the time of the Russian Revolution the population of 11,000,000 worked out at less than three to the square mile.



THE SOVIET REPUBLICS OF SIBERIA AND CENTRAL ASIA



D. Carruthers

THE YENISEI—SIBERIA'S LONGEST RIVER

Of the many great rivers of Siberia, the Yenisei (above) is the longest. It will probably—in its lower reaches, at least—become of considerable international importance. Mushroom ports have sprung up in a few years along the estuary, and even as far up stream as Igarka, 350 miles from the mouth, where the ebb and flow of trade will one day conquer the ice barrier of the Arctic. Meanwhile at the other end of its course the Yenisei provides a pleasant summer fishing ground for the peasants.

Western Siberia is a continuation, on the same grand scale, of the plains of European Russia, with tundras, great forests of birch, larch, silver fir, and other conifers, an agricultural black-earth belt, and rolling grassy steppes (See Russia). Eastern Siberia is rugged and mountainous or a broken table land, with higher mountain chains or mountainous plateaux on the south and south east. The Far East region includes the peninsula of Kamchatka (*qv*), a famous fishing area.

Four of the five largest rivers of Asia, the Ob, the Yenisei, the Lena, and the Amur, drain Siberia. All of these are more than 2,000 miles long. Like Russia, Siberia has many lakes and immense swampy tracts. Lake Baikal, with a length of 400 miles, an area of 13,330 square miles, and a greatest depth of nearly 5,000 feet, is the largest freshwater lake in Asia. The rivers and lakes of Siberia give an exceptionally plentiful supply of fine freshwater fish.

Open to the Arctic Ocean but walled off by mountains to the south, with immense plains over which the terrible *burans* or snowstorms can sweep unchecked, Siberia has a very harsh climate. Average winter temperatures range from 53 degrees below zero to 2 degrees above. Agriculture is impossible in the northern area, and is hampered by drought in some portions of the interior, and by excessive moisture on the Pacific coast. In the southern part of western Siberia, however, during the hot, brief summer, grain and vegetables grow very rapidly. Wheat, live stock, beef, and eggs are largely exported.

Furs are abundant and are especially rich, soft, warm, and light. The dense forests are a source of timber. They were almost untouched before the Soviet regime. Rich deposits of coal, iron, copper, lead, silver, gold, platinum, graphite, tin, zinc, salt, mica, and precious stones are worked. Ivory is "mined" on the Arctic coast, where vast stores of the remains of prehistoric animals lie in alluvial drift.

Manufactures are insignificant because of the general backwardness of the country and difficulty of transportation. The completion of the Trans Siberian Railway (1891-1905) gave a great impetus to the development of the country. This railway is the longest in the world—4,500 miles.

'Sent to Siberia'

About two thirds of the inhabitants of Siberia are Russians, and the rest consist of various native tribes of Tartar, Turk, Mongol, and other non-Caucasian stocks. The conquering Mongols of the 13th and 14th centuries came from the Baikal region. It was Peter the Great who began the practice of exiling political prisoners to Siberia, and early in the 19th century ordinary criminals were deported thither. Late in the 19th century the government encouraged voluntary immigration, which proved quite successful. The Soviet authorities have re-introduced the practice of sending criminals to Siberia.

Most of the largest towns are on the main Trans Siberian Railway (which now has a double track) or its branch into Turkistan—the so-called "Turksib." Travelling eastward, we pass

through Sverdlovsk (population, 425,000), Cheliabinsk (273,000), Omsk (280,000), Novosibirsk (405,000), Krasnoyarsk (189,000), Irkutsk (243,000), Chita (102,000), Khabarovsk (199,000) and Vladivostok (206,000), Russia's great seaport on the Sea of Japan. On branch lines are other cities, including Tomsk (141,000), Semipalatinsk (120,000), and Blagoveshensk (63,000).

Most of the area we still know as Siberia is contained within the Russian Soviet Federated Socialist Republic (Russia proper), the boundaries of which disregard any distinction between Europe and Asia. Kazakhstan, the southern part of which comes within the compass of Central Asia, is now a constituent republic of the Soviet Union. There are also autonomous republics, e.g. the Yakutsk and Buriat-Mongol Soviet Socialist Republics.

Under the Five-Year Plans extensive development has taken place in all parts of Siberia, even in the Arctic zone. In the north-east, gold-mines are in flourishing operation, helping to make Russia the second among the world's gold-producing countries. At Igarka, on the Yenisei, saw-mills hum every hour of the day, and nickel has brought fame to remote Norilsk. With the aid of powerful ice-breakers, cargo steamers are convoyed from Archangel to the Pacific, and motor-driven sledges and aircraft now traverse wastes that were once sacred to the sleigh and the reindeer. Agriculture is also flourishing, special grades of hardy grain and special strains of fruits (even strawberries!) having been developed for cultivation in the short Arctic summer.

The exploitation of the valuable mineral deposits in the Urals and the central Kuznetsk basin has meant the growth of great industrial cities in these areas. In central Siberia are Stalinsk and Prokopyevsk, both with a population of well over 120,000, while Magnitogorsk (population, 145,000) is only one of the giants of the new Russia in the heart of the Urals.

Sib'yls. According to an old Roman tradition, the Cumaean Sibyl or prophetess came from the east to the Roman King Tarquin the Proud offering nine books of prophecies, but at so enormous a price that he refused to buy. She then destroyed three, and offered the remaining six at the same price, and was again refused. Destroying still another three, she asked as much for the three left, and Tarquin's fear and curiosity finally induced him to buy. They contained advice regarding the religion and government of the Romans, and were care-

fully guarded in the temple of Jupiter and consulted on occasions of national emergency. After the temple was burned, in 83 B.C., a new collection was made of about 1,000 lines, gathered from all the cities of Greece, Italy, and Asia Minor; this was kept until some time between A.D. 404 and 408, when the Christians caused it to be publicly burned.

Several other sibyls or inspired prophetesses are named by various Greek and Roman writers. Legend said they lived to an incredible age. The Sistine Chapel in Rome contains world-famous wall paintings by Michelangelo of the Cumaean, Delphic, Persian, Libyan, and Erythraean sibyls.

Sicily. (Pron sis'-i-li) On the walls of a Moorish palace in the Sicilian city of Palermo runs this legend:

"Europe is the glory of the world, Italy of Europe, and Sicily the fairest garden of the Mediterranean." This "fairest garden" is the largest island in the Mediterranean. Mount Etna, which dominates it now as always, looks down upon an unsurpassed panorama of curving bays, shining cliffs, and crowded fishing villages perched like nesting sea-birds among rocks and crags. The landscape shows rugged mountains, rounded hills grey-green with olives and terraced vineyards, sunny plains and valleys, and many old towns.

Picturesque towns are these, with their vine-covered walls, their gardens and fountains, and



BUILDING THE 'TURKSIB' RAILWAY

The effect of railway building over vast stretches of Asiatic Russia has been very marked, and in a few years villages through which the railway now passes have become prosperous towns. Above is seen a construction train in a newly-made cutting on the "Turksib" railway, which links the Trans-Siberian Railway at Novosibirsk with Turkistan.

SICILY

their ancient palaces and churches, flooded with sunshine and the heavy fragrance of flowers. At Etna's foot, on the east, across the strait of Messina from the toe of the Italian boot, lies Messina. This great seaport was founded by the Greeks about 600 B.C. under the name of Zancle (from Greek *zanlon*, "sickle"), referring to its peculiarly shaped harbour. From the earliest times it has been of commercial importance. Even the ancient Phœnician trading vessels threaded their way between the fabled rocks of Scylla and the perilous whirlpool of Charybdis in the straits outside the harbour.

When Earthquake Wrecked Messina

Messina today is a modern city humming with industry and has a population of 192,000. Its inhabitants have shown their pluck in the face of centuries of disasters culminating in the terrible earthquake of 1908, which almost completely destroyed the place. It is estimated that 76,000 persons were killed, and 95,000 more were injured. Famine and pestilence, following the catastrophe, caused many more deaths.

Near Messina, along the eastern coast, is Taormina, perched on the rocks 700 feet above the Ionian Sea. Far to the south, past Catania, stretch yellow plains to the famous Syracuse, once the greatest city of Sicily. Across a temple-crowned valley on the south-western coast lies Girgenti.

On the north-western coast, at the mouth of the orange-bowered "Golden Shell" valley, lies Palermo, the largest city in Sicily and the fifth largest in Italy, with a population of about 411,000. The Phœnicians, the Carthaginians, Greeks, Romans, Goths, Saracens, Normans, French, and Spaniards who have ruled there, have all left their marks on this old-time city. The University, founded in 1779, has recently risen in importance. The city is a military headquarters and has a large arsenal. Near by is a royal winter palace.

Because the elementary education is so poor, many of the Sicilians are very illiterate. The Mafia, a powerful secret organization which terrorized the entire island, was the curse of Sicily as the Camorra was of Naples, until firm measures taken by the Fascist government broke its power. Scores of Mafia leaders were sent to prison or exile, and the organization's long record of crime and violence was brought to an end.

Sicily's history is a tale of changing masters, of conquests and cruel oppression. It was first great under

the Phœnicians nearly 3,000 years ago. With the Greeks, who arrived in the 8th century B.C., came Sicily's intellectual "golden age." Then came the Carthaginians, who soon had to yield to Rome. Vandals and Goths found their way across the narrow straits from the mainland. Then Byzantine rulers of Constantinople held the island against the marauders for a brief period.

With the Saracens in the 9th century came a new epoch. Under the Emperor Frederick II (1194-1250) Sicily attained what was, perhaps, the highest point of her career. Sixteen years after Frederick's death, Charles of Anjou overthrew the last of the Hohenstaufen dynasty, but his cruelty and oppressive taxation greatly angered the Sicilians. On the day after Easter in 1282, as the vesper bells were ringing, the people of Palermo massacred 4,000 French. Other massacres followed the "Sicilian Vespers," after which independent Sicily chose Pedro III of Aragon for King.

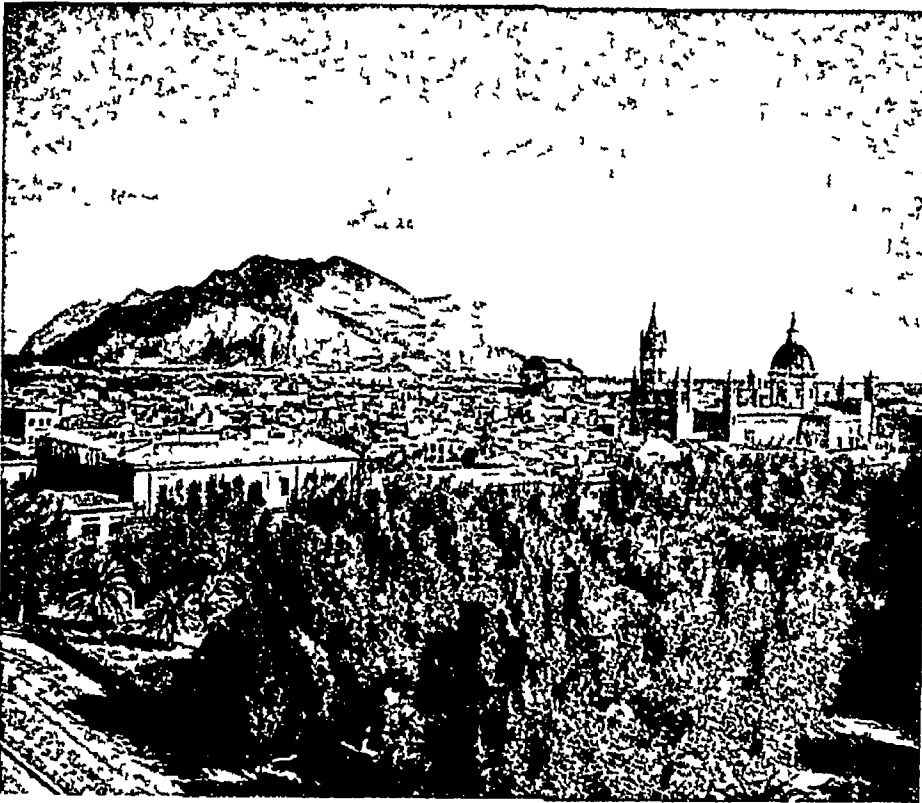
Spanish, French, and Austrian despots brought to Sicily a long period of darkness and



Will F. Taylor

GREEK RUINS IN SICILY

Girgenti, near Sicily's southern shore, was founded by the Greeks about 582 B.C., and its population is believed to have been at one time nearly 200,000. The chief interest of Girgenti is centred in the ruins of the Greek temples in the neighbourhood, such as that of Castor and Pollux, seen above framed by a blossoming almond tree.



SUNNY PALERMO, SICILY'S CAPITAL CITY

Sicily's romantic capital stands on a wide bay on the north coast of the island. This view, taken from the Royal Palace, shows Monte Pellegrino in the background, and on the right the cathedral, founded in the 12th century by an Englishman, Archbishop Walter

stagnation. In 1734-35 Don Carlos established the Bourbon dynasty in Naples and Sicily, uniting the two territories under the name of the Kingdom of the Two Sicilies, and down to 1860 Sicily was governed by Bourbon kings. Then Garibaldi came to deliver the Sicilians, finally annexing Sicily to the dominions of Victor Emmanuel which a year later became the Kingdom of Italy.

Sicily is separated from the mainland by the Strait of Messina. It is a fragment of the narrow land-link which in prehistoric times joined Italy to Africa. Its area is 9,935 square miles. The chief exports are sulphur, fruits (grapes, olives, oranges, lemons, etc.), fish (a great supply of tunny and sardines, as well as sponges and corals, are taken from Sicilian waters), wines, oil, sumac, and salt. Population, about 4,000,000.

Siegfried. (Pron sēg'-frēd) Long ago, the legend runs, in a gloomy cave in the forests of the Rhineland, there lived Siegfried, a kingly youth, tall and strong, with fair hair and blue eyes. His only companion was Regin, a swarthy dwarf who had reared him.

When Siegfried grew to manhood Regin told him of his parentage, that he was the orphaned son of a fearless king, who had died gloriously in battle. "The time has now come," Regin said, "when you must leave the forest and go in search of adventure in the world." So Siegfried prepared to depart, but first he asked

on the anvil. It did not break, but the anvil was cut in two.

In the long evenings Regin had told Siegfried of the fearful dragon Fafnir, who guarded in his cave a priceless treasure, slaying those who tried to gain it. To the den of the dragon Siegfried now made his way. When Fafnir heard him approaching he roared until the ground trembled. Nothing daunted, Siegfried guarded himself from the maddened rushes of the hideous creature, until, at last, he killed the dragon. Thus Siegfried gained the treasure.

By bathing himself in the blood of the slain dragon he became proof against wounds, excepting in one small spot between the shoulders where a hinden leaf had fallen. Accidentally tasting the blood, he discovered that he was able to understand the language of the birds and beasts, and by eating the monster's heart he was endowed with even greater strength. According to another story the treasure which Siegfried gained was obtained by slaying the Nibelung kings. (See Nibelungs, Song of the)

Siegfried at last came to the court of Gunther, king of the Burgundians, where he was greeted as a hero, with feasts and all honour. He wedded Kriemhild, sister of Gunther, a maiden of marvellous beauty, and he became the most heroic and beloved knight in the kingdom.

But among the king's vassals was one, Hagen by name, who was jealous of Siegfried's glory

By clever lies he induced Gunther to believe that Siegfried would some day steal his power, so the king agreed to help to destroy Siegfried.

Aware that there was but one place in which Siegfried could be wounded, Hagen treacherously played upon Kriemhild's fear for Siegfried's safety on the battle field, and begged her to tell him of the fatal spot, saying, "I ride close behind your lord in battle, and, should the fight wax fierce, I might protect him." Kriemhild innocently disclosed the secret, and, unknown to Siegfried, she sewed a tiny cross between the shoulders of his tunic. The dauntless hero thus became an easy prey to those who sought to slay him.

Gunther arranged a hunt, and the cowardly Hagen thrust a spear into the fatal spot while Siegfried lay drinking from a woodland stream. Mortally wounded, Siegfried attacked Hagen, but died before he had avenged himself. The whole kingdom mourned Siegfried's loss, and it is said that even the gods sorrowed and there fell upon the earth a gloom that lasted for many days. This story is the theme of one of Wagner's operas.

Signalling. Even the most primitive of peoples have always had systems of signalling by which they could transmit information over long distances. For short distances the early signals were chiefly gestures

or signs with the hands or body. For longer distances, especially in warfare, beacon lights, such as fires and torches, were used, as well as smoke columns, the display of shields, spears, banners, etc. These early methods seem crude indeed in comparison with the modern telephone and telegraph. But even today various signal systems are in use, and are of the greatest importance, especially at sea, in military operations, on railways, and in meteorology.

At sea, signalling is an important phase of navigation. Most nations use the International Signal Code, comprising an alphabet of flags in variously coloured designs, and a code pennant, used also for answering. This code is

translated into the languages of the maritime nations, so that sailors of any tongue may read the message fluttering from the signal bridge. When the flag colours cannot be seen (they are visible for only about three miles), cones, balls, and drums may be placed in vertical arrangements, or a fixed "semaphore" used.

Before the telegraph was invented, the semaphore was extensively employed to transmit dispatches. Codes for spelling out messages were devised, in which different positions of the signal arms stood for different letters. Operators observed distant semaphores through telescopes.

Today the semaphore is used chiefly for signalling on railways (See under Railways).

At night, lights replace flags. Red, green, or white stars are shot from a Very pistol, and searchlights or smaller flashing light systems transmit the dots and dashes of the International Morse Code (See Telegraph). A searchlight beam turned upon the clouds may be seen by ships many miles below the horizon.

The Navy employs wireless for rapid or long-distance dispatches between ships. Wireless is an invaluable aid regardless of distance in foggy or stormy weather. Life at sea has become much safer through wireless communication, and the use of radio compasses, radio beacons, and radio depth indica-

tors. Weather reports and storm warnings are regularly broadcast to ships and aeroplanes.

In fogs and storms, signals are sent out at regular intervals from lightships and shore stations (See Lighthouses and Lightships). Submarine signals, including those made by strokes of a bell or impulses from an oscillator immersed far enough to be free from wave disturbances, are picked up by microphones attached to the bows of the ship well below the water line. The microphones are electrically connected to the bridge and other convenient operating positions on board.

Signalling in the British Army is chiefly a responsibility of a special branch, the Royal



SIEGFRIED SLAYING THE DRAGON

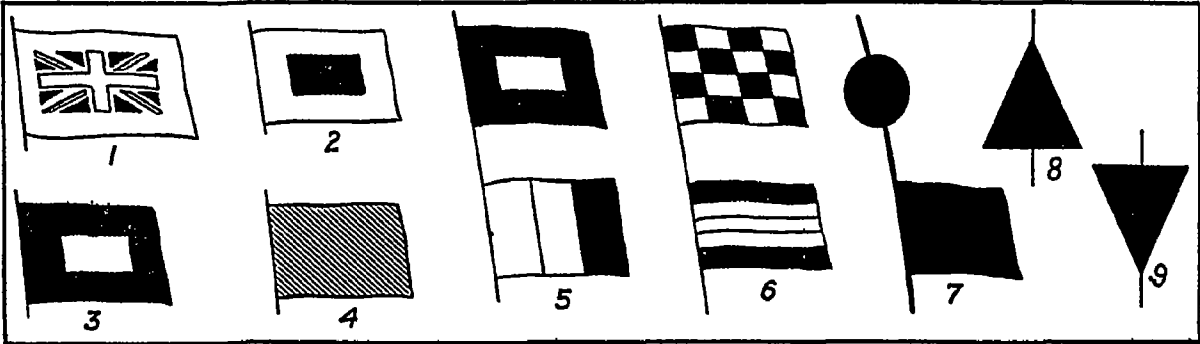
Siegfried is the hero of the most famous of Teutonic epics, the Nibelungenlied. In our illustration he is depicted slaying the dragon Fafnir. After he had killed the monster he made himself invulnerable—save for one spot where a leaf stuck—

by bathing in the dragon's blood.

By courtesy of George G. Harrap & Co.

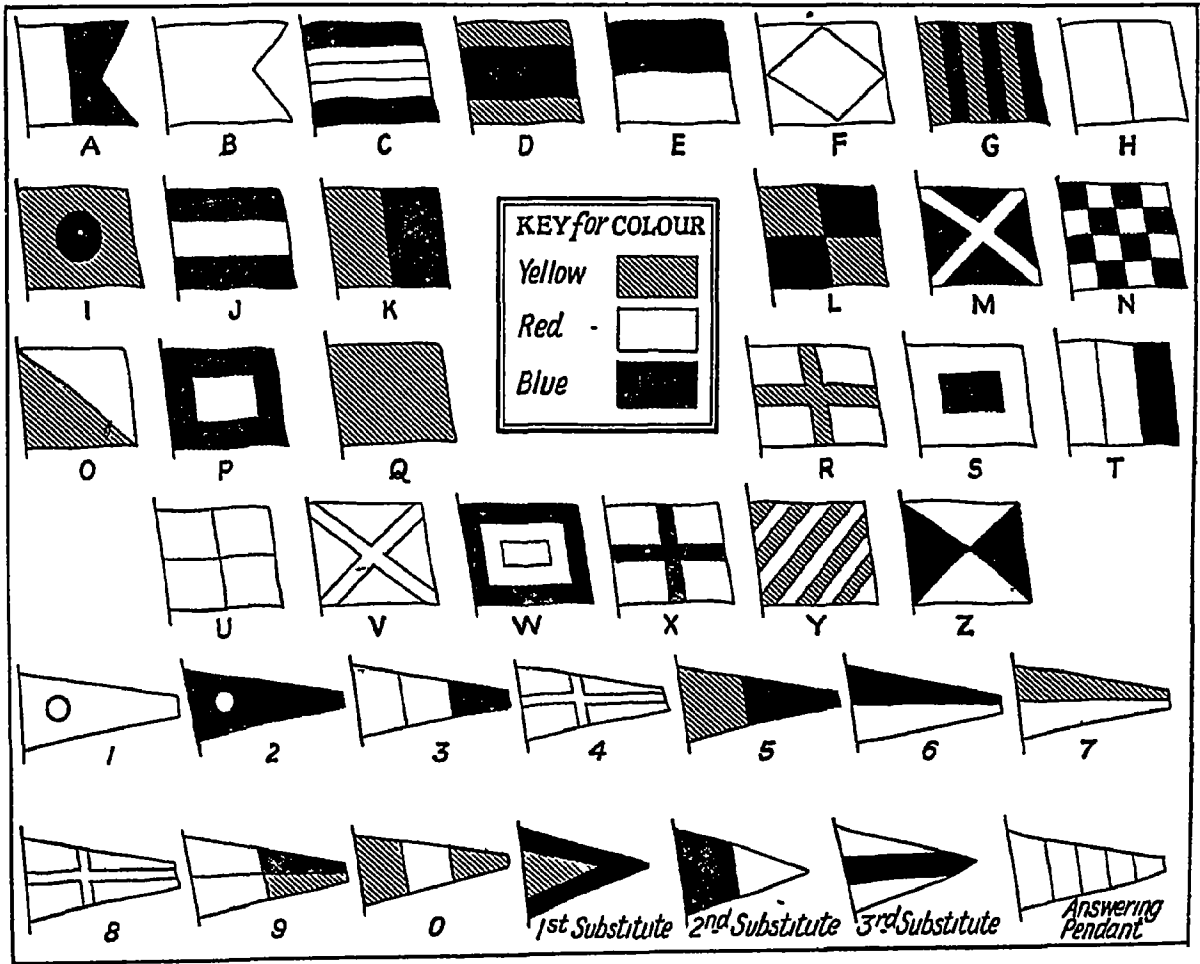
Corps of Signals The principal means of communication are telegraphy and telephony, human messengers, homing pigeons, and visual signals, such as heliographs, fireworks, and signal lamps. Signalling from aircraft to ground is done by wireless, dropped messages, homing pigeons, and such fireworks as the Very pistol.

Signalling from ground to aeroplane is done by wireless, fireworks, searchlights, picked-up messages, or by rectangular strips of white cloth. **Silicon.** This element might well be called "the earth maker," for the earth's crust consists largely of silicon compounds, such as the oxide of silicon, called silica (SiO₂), and the silicates.

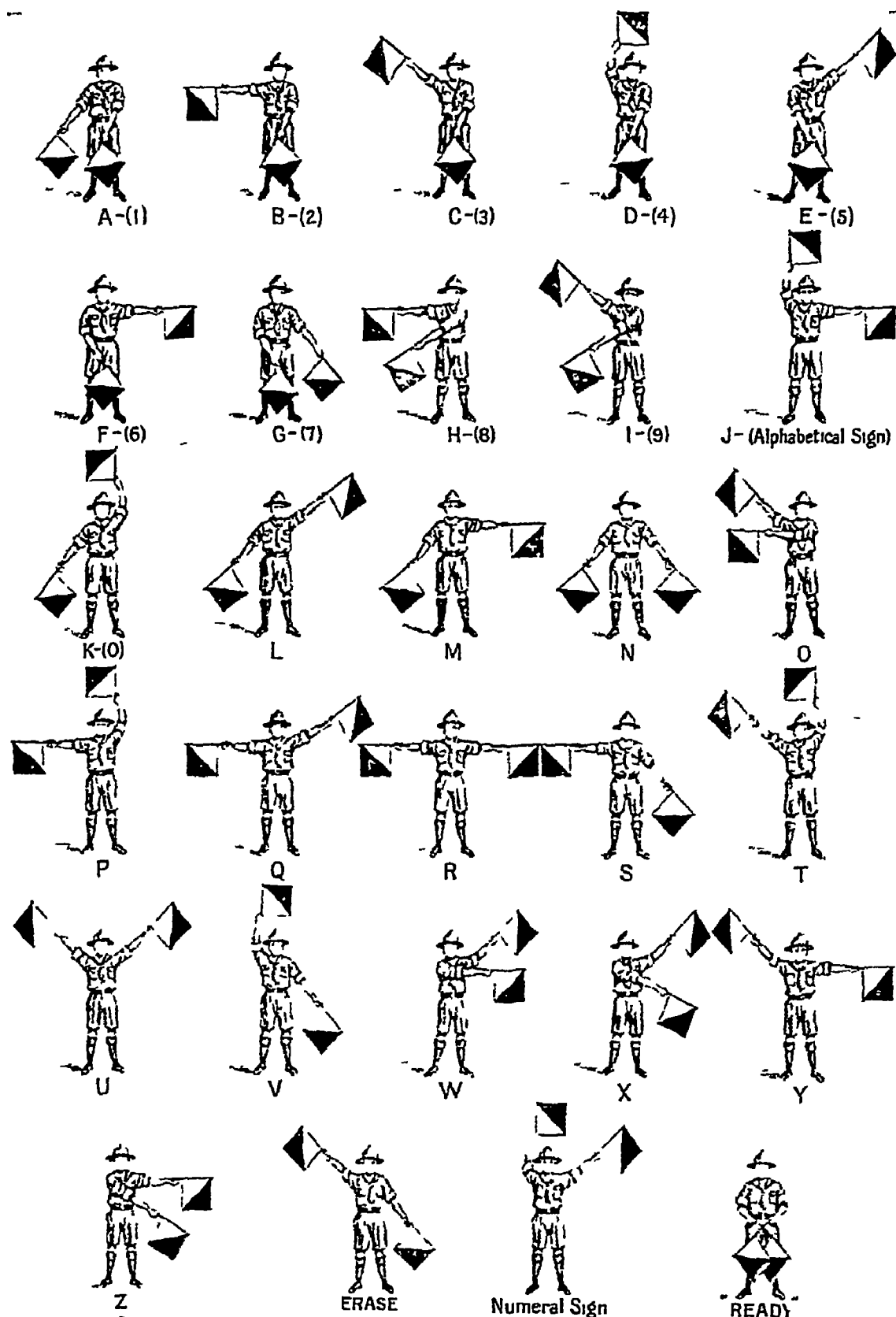


THE CODE OF SIGNALS IN INTERNATIONAL USE

Above (1) British Pilot Signal (2) Engines going astern (3) The Blue Peter—vessel about to sail (4) Quarantine Flag (5) International Code Pilot Signal (6) Distress Signal (7) Distress Distant Signal (8) Cone warning of northerly gale (9) Cone warning of southerly gale. Below: Alphabetical flags and numeral pendants. The alphabetical flags have special meanings when flown alone. These are: A. Undergoing Speed Trial; B. I am taking in or unloading explosives; C. Yes (affirmative); D. Keep clear of me; I am manoeuvring with difficulty; E. I am directing course to starboard; F. I am disabled—communicate with me; G. I require a pilot; H. I have a pilot on board; I. I am directing course to port; J. I am going to send a message by semaphore; K. You should stop your vessel instantly; L. You should stop; I have something important to communicate; M. I have a doctor on board; N. No (negative); O. Man overboard; P. Blue Peter—in harbour; At sea—your lights are out; Q. My vessel is healthy; I request free pratique; R. The way is off my ship; S. Engines are going astern; T. Do not pass ahead of me; U. You are standing into danger; V. I require assistance; W. I require medical assistance; X. Stop carrying out your intention and watch for my signals; Y. I am carrying mails; Z. Used to address or call shore signal stations. As regards colour, black is shown black, yellow, red and blue as in the key.



THE SYSTEM OF SIGNALLING BY SEMAPHORE



Here are the positions you would use in sending a message by means of semaphore flags. You will notice that some represent both letters and numerals. The rule is that these positions usually mean letters, but if you give the "numeral" signal each subsequent position means a numeral until you give the 'alphabetical' sign then each position means a letter. The method is exceedingly rapid and is not very difficult to learn but the signals have to be given very clearly with fully outstretched arms if they are to be read accurately and with ease.

of aluminum, magnesium, iron, and other metals. Quartz and most sand, granite, and many other rocks are silica formations, while clays and soils usually contain silicates. Plentiful as it is, silicon never occurs free in Nature, but when extracted from its compounds appears as a greyish non-metallic substance.

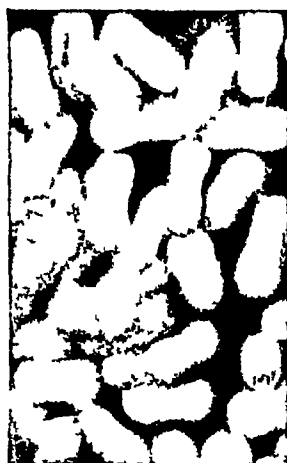
Silicon enters into the composition of many semi-precious stones, including agate, amethyst,

aventurine, bloodstone, cairngorm, carnelian, cat's-eye, chalcedony, chrysoprase, jasper, mocha stone or moss agate, onyx, opal, rose quartz, and sardonyx. Natural compounds of silicon play an important part in industrial chemistry and in the manufacture of glass, earthenware, furnace linings, and other heat-resisting material. Sodium silicate (Na_2SiO_3) is the "waterglass" used for preserving eggs.

An INDUSTRY from an INSECT'S THREAD

A caterpillar is the foundation of the world-wide silk industry—the caterpillar of a moth first found in the Far East. It is this little creature that spins the thread which keeps thousands of looms busy.

Silk. Once upon a time a dainty little empress sat in her garden watching the sun shining down on her mulberry trees. This empress lived more than 4,500 years ago, the story goes, in Hang-chow-Foo, the "City of Heaven," which was the old southern capital of China, and her name was Si-Ling-Shi. Presently she saw a caterpillar on one of the branches making for himself a beautiful little house with threads spun from his body.



Silkworm cocoons

All day long the empress watched the caterpillar. She saw that from the underside of his head flowed a shining thread, which he wrapped round and round his body until he was all enclosed in a delicate little cocoon.

"But the whole beautiful thing is just one long thread, wound as if on a distaff!" cried the empress. "If I could only unwind it, what an exquisite fabric it would make! Why couldn't I? It just needs patience."

So she coaxed the emperor to give her a grove of the choicest mulberry trees. And there she worked, carefully gathering the tiny eggs of the silkworm moths, and, when they were hatched, picking with her own hands the tenderest leaves for the baby worms to eat, until the time came when they, too, had spun their exquisite cocoons.

Then one happy day she succeeded in twisting together the strands from a number of the little silk-covered cocoons into many long threads. Hundreds of yards she wound off, and from them she wove a wondrous shimmering fabric more beautiful than any that had ever been seen before. To this day it is called "silk" in China, "soie" in France, and "silk" in English-speaking lands.

All over China the culture of the silkworm spread, and when the empress died the southern part of the empire was a bower of mulberry trees, and Hang-chow-Foo was famous for its beautiful silks and embroideries. The empress was placed among the Chinese deities as the "Goddess of the Silkworms," and every year when the mulberry leaves open there is a feast in her honour.

While this is only a legend, it bears witness to the fact that silk culture was known in China from a very early time. For more than 2,000 years the Chinese manufactured silk and sold it to their neighbours in Japan, India, and Persia. But the secret of how it was made was faithfully kept by the Chinese, though it was known to hundreds of millions of the vast empire's population.

When Alexander the Great swept with his victorious Greeks through Asia into India, about 330 B.C., he carried back with him to the Mediterranean lands the first raw silk that Europe had ever seen. But he did not get the most important thing of all, the secret of the silkworms, which remained locked in the strange old walled country of China until 300 years after the Christian era.

Smuggling the Secret of Silk

It was then carried to Japan by four Chinese maidens, kidnapped by the Japanese from a silk-weaving village. At about the same time a Chinese princess, who had married an Indian prince, is said to have carried the eggs of the moths hidden in her headdress to her new home, and taught her new subjects this art.

The knowledge of silkworm culture spread very slowly, and as late as A.D. 550 all the silk in the Roman Empire was brought by caravan from Persia and India, which made it so expensive that it was an extravagance even for emperors. Not until Justinian's reign (527-565) were the first silkworms brought to Constantinople. Two Persian monks who had lived in China were induced by the emperor to go back to that land and try to procure some

THE RAW SILK INDUSTRY FROM START TO FINISH



Above are shown various stages in the derivation of silk. (1) Gathering mulberry leaves, in Japan to feed the silkworm (2) Matured silkworms feeding at the farm at Lullingstone Castle Eynsford, Kent, of Lady Hart Dyke who has done much to revive the silk industry in England (3) Emptying a sack of cocoons prior to the silk extraction process at Lullingstone (4) Cocoons soaking in a special tank, before the extraction of the tiny silk thread. (5) Japanese workers weighing raw silk on very delicate scales

Photos Krystone

SILK

silkworm eggs They returned safely with the precious eggs concealed in their hollow pilgrim staffs, and from those eggs were produced the silkworms which supplied the western world with silk for 1,200 years

The new industry spread slowly from Constantinople Under the conquering Saracens it was carried both east and west Sicily became one of the homes of silk cultivation and manufacture, and it spread next to Florence, Milan, Venice, and Genoa, all of which became famous for their beautiful fabrics Silk manufacture began in France as early as the 13th century, but the production of cocoons was not successfully begun until the close of the 15th About the same time England began to manufacture

raising districts of the world, for the climate there permits of three crops of cocoons a year—one in March, one in July, and one in November Some of the other countries have two crops, others only one In England, it is not easy to rear the worms successfully, but at least one silk-farm is now running as a flourishing business

The wonderful little silkworm is hatched from a tiny egg about the size of a pin's head In the early summer the mother moth, *Bombyx mori*, lays from 200 to 500 of these eggs on strips of paper or muslin prepared for her They are kept in a cool, dark place, and in the spring are put into trays and hatched by artificial heat When the young worms or larvae emerge from the eggs they are little dark wriggling creatures about a quarter of an inch long They



THE REELING OF THE SILK BY JAPANESE WORKERS

After the cocoons have been gathered and the worms killed by dry heat or steam, the cocoons are sorted according to colour, size, and quality Then the delicate threads from several cocoons are unwound and laid together so as to make a single strand, and these strands are wound on reels In the small communities of Japan, reeling is done as you see it here, but silk reeled in this way is apt to be uneven and lumpy The best silk is reeled in large factories by machinery

fabrics from imported silk skeins After 1685, when the Edict of Nantes was revoked, 400,000 Huguenots, who were especially skilled in weaving silk, fled from France to England, Switzerland, and Germany, and gave tremendous impetus to the growth of the industry in these countries

The culture of raw silk can be profitably undertaken only where there is an abundant supply of cheap labour, since the care of the worms and the preparation of the raw silk requires much patient attention Today raw silk is produced in considerable quantities only in China, Japan, India, France, Italy, Persia, and Turkey Bengal is one of the ideal silk-

have prodigious appetites, and soon they are eating their own weight in mulberry leaves daily

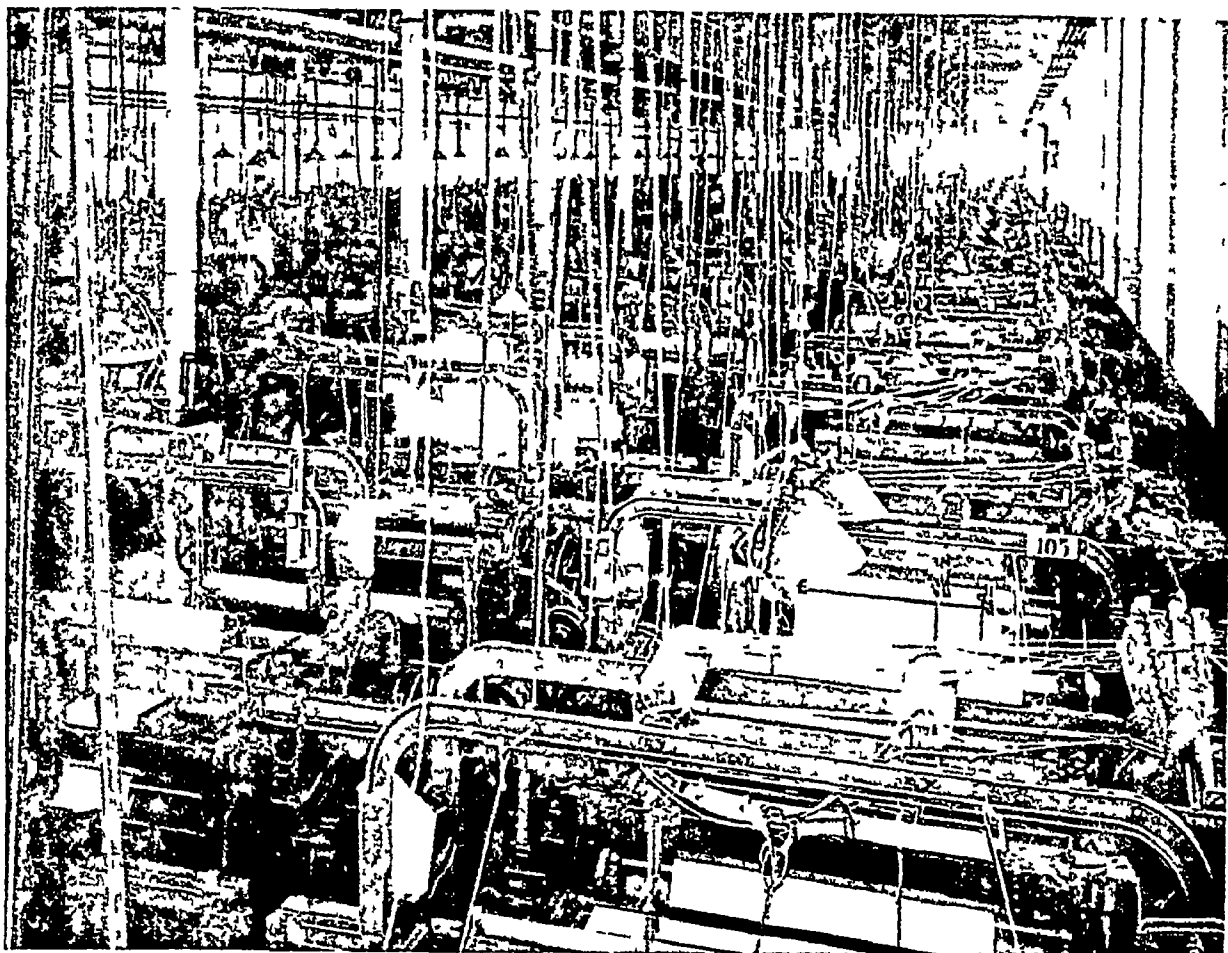
In four to six weeks the worms have become plump, greyish-white caterpillars, about 3 to 3½ inches long, and they are ready to spin their cocoons They then climb up the brushwood branches or the many-celled racks prepared for them, and begin the work for which they have been so carefully reared

On both sides of their bodies are glands which have become filled with thick glue-like material The worms now press this out in two slender threads which stick together as they emerge from an opening in the upper lip, called the

WEAVING YARDS AND YARDS OF PATTERNED SILK



Isn't the world of invention as full of surprises as a fairy tale? Take the wonderful Jacquard loom, for instance which you see weaving those pretty patterns in silk. Much the same device that is used in your player-piano perforated paper roll—you see them folded up overhead—controls the action of the needles that weave these patterns, causing them to skip and dip among the threads, precisely as if each one had a human hand and a human brain behind them! The cards, like the piano player rolls, have holes in them which control the needles as the holes in the player roll control the keys.



MECHANICAL FINGERS THAT WEAVE OUR SHIMMERING FABRICS

This shows the interior of a silk weaving mill. The "warp" threads—those which run lengthwise of the fabric—are first attached to a beam side by side. The beam is then placed in the back of the loom and the warp is unwound from this each thread passing through an eyelet. As the machine revolves the warp threads are constantly lifted and lowered, and in the opening made by this rise and fall the shuttle carrying the "weft" thread flies across the warp.

"spinneret." The fluid threads at once harden in the air into the tough silk fibre, and the larvae weave them into cocoons completely surrounding their bodies by bending their heads forward and backward in a figure eight loop. In three or four days the cocoons are completed. In shape and size they are somewhat like pigeons' eggs, and each contains from 500 to 1,200 yards of continuous thread.

Silk from 'Wild' Worms

Usually the cocoons woven by domesticated silkworms in the Orient are white or light yellow, but nearly all the cocoons woven in western countries are yellow. In some parts of the Far East the cocoons of other insects akin to the silkworm are used to a certain extent, but they are not so good as those of the domesticated silkworm. These "wild silks"—the commonest and best of which is called *tussore* silk, because it comes from the tussur worm—are usually pale green in colour. Familiar examples of these fabrics are pongee and shantung silks. The colouring matter in wild silks cannot be removed by boiling, so the wild silks will take only the darker dyes. Then, two or three days after the cocoons are completed they are

gathered and sorted. A few of the best are put aside in a warm place and carefully guarded until the moths come out, to lay eggs for next season's brood of worms. The rest of the cocoons are put into a hot oven to kill off the worms within.

Now the cocoons are soaked for a few minutes in hot water to soften the gummy coat, while a girl with a small twig brush constantly stirs them. The outside of the cocoons is a coarse, flossy covering of loose fibre, which adheres to the twigs and is so removed. Then the cocoons are put into trays filled with warm water, and the ends of several of the long threads are brought together and passed through a tiny guide like the eye of a needle. The fibres stick together to form a single strand and are wound upon a reel.

When the reel is full the silk is taken off in large hanks, and this is the form in which most raw silk reaches the factories. It takes from 130 to 140 lb. of cocoons to yield 12 lb. of raw silk, and the fastest workers can reel only a pound or two a day.

Before the silk is ready to be woven on the loom, it must go through the process known as

"throwing" In this operation several threads are twisted and doubled into a more substantial yarn, while any imperfections are removed

"Tram" silk, used for the woof in weaving, consists of two or more threads twisted together To make "organzine," which is used for the warp of heavy fabrics, the threads are double twisted This is done on machines which twist the threads about 16 turns to the inch in one direction, then double it and twist it about 14 turns the other way To convert a single pound of raw silk into organzine requires as many as 264,000,000 revolutions of a spindle

'Weighting the Yarn with Tin

The yarn must now be scoured or degummed to remove the gummy coating and colouring matter, by steaming or boiling in soapy water This robs the silk of about one fifth of its weight To make up for this shrinkage it is the common practice to "weight" the silk threads by putting them in a bath of tin dissolved in hydrochloric acid By alternating this bath with another containing phosphate of soda, it is possible to continue the process until a pound of raw silk, which shrank to 13 ounces when it was degummed, has taken on enough tin to weigh from 20 to 60 ounces Some silk fabrics are thus more than half tin

This weighting lessens the durability of the fabrics, and makes them harsh and crisp, but it greatly reduces the cost It is mostly used in the cheaper silks After the silk has gone through these processes, and has been bleached or dyed, it is ready for weaving (*See Spinning and Weaving*)

Waste silk, that is, the silk from the outside of the cocoons, and the large proportion of the inside of the cocoons that cannot be unwound, is treated much like wool, and is spun into threads called "spun" silk This is used for silk yarns and for making fabrics of less durability than true silk

Another aspect of this lovely fabric comes to the front in the grim days of war Then silken parachutes sometimes save the lives of fighting airmen and are used for dropping supplies from aircraft, and powder charges for some types of guns and trench mortars are contained in bags of silk Silk is also used for many purposes in industry—for example, in the "bolting cloths" used in sifting flour

Rayon is entirely different from pure silk, but it possesses silky lustre Indeed, artificial silk may be the more lustrous of the two, but it has a very different "feel" It is made by the action of various chemicals on cotton or wood-pulp (*See Mulberry, Rayon*)

Silver. Silver has been known and used by Man since prehistoric times It is mentioned in the Chinese classics, dating from 2500 B C Herodotus, the Greek historian, says "So far

as we know, the Lydians were the first to make coins of gold and silver" The silver mines of Laurium, in Attica, are famous in Greek history, and those in Spain, of a later date, are even better known In part it was Rome's jealousy of Carthage's possession of these Spanish ore deposits that brought on the first Punic War

Silver is the most malleable of metals, with the exception of gold, and is next to platinum in ductility One ounce of silver can be drawn out into a wire more than three miles long, and silver leaf can be beaten to a thinness of one ten-thousandth of an inch Silver is the most perfect conductor of electricity known, but it is far too costly to be used extensively for this purpose Silver melts at 1,832° F and boils, becoming a gas, at 3,550° F This gas is a pale blue vapour, which absorbs large quantities of oxygen As it cools and becomes solid again it expels the oxygen with great violence—a curious phenomenon known as "spitting silver"

About three quarters of the annual production of silver is made into coins, the remainder being used for industrial purposes Silver forms useful alloys with almost all metals, but chiefly with gold and copper It combines also most readily with sulphur, forming the black silver sulphide so often seen on spoons and forks which have been in contact with the yolks of eggs

Silver is the principal component of one of the most dangerous explosives known, called silver fulminate When dry, this compound explodes with terrific violence, even on being touched with a feather

Silver's Use in Photography

Silver, compounded with chlorine and more often with bromine, forms those useful chemical salts which are sensitive to light and are therefore used in photography The image in a photograph is composed of deposits of pure metallic silver in a gelatine coating (*See Photography*)

Various compounds of silver are used in medicine and surgery The most important of these is silver nitrate or "lunar caustic," a powerful antiseptic Certain silver chemicals are used internally for gastric disorders and dysentery, but taken in large quantities they are dangerous poisons

Wounds are sometimes sewn together with silver wire and broken bones bound with silver bands Fractured parts of the skull are sometimes replaced with silver plates This metal is also used extensively in the manufacture of surgical instruments

Silver is mined principally in Canada, the United States, Mexico, South America, Australia and Spain It is often found associated with copper and lead, and much of the world's supply is obtained as a by-product in smelting these metals Indeed, unless a rich deposit

THE FINE ART OF THE SKILFUL SILVERSMITH



These pictures tell the story of that silver cup at the bottom. The figure on the cover is cast in the mould the masked workmen are pulling from the furnace. The rest is modelled by hand. First a silver sheet is fixed around a wooden form or "chuck." This revolves in a lathe while the circular designs are pressed in with steel tools. The embossed portions are tapped out by a steel mallet set vibrating in a vice. The cover rim is hammered out by hand, and certain other portions of the design are stamped by a press, or "chased," that is driven in with the blows of a punch. Last of all comes the polishing against a spinning wheel.

is found, the mining of silver for itself alone does not often prove profitable. The silver mines of Cobalt, Ontario, are relatively shallow. The ore here is, perhaps, the richest known in the world today, in places running to as much as 200 lb of pure silver to the ton. In the Cobalt region much of the silver occurs in metallic form. (See also Mines, Money)

Simon, JOHN ALLSEBROOK, 1st Viscount Simon of Stackpole Eldor (b 1873). Many statesmen have written books—Disraeli wrote many novels—but Viscount Simon is probably the only politician who has written a book about his mother—"Portrait of My Mother," published in 1937.

For many years John Simon, who became a KC in 1908, was one of the best-known lawyers in England. He entered Parliament as a Liberal in 1906, and four years later was made Solicitor-General and knighted. From 1915 to 1916 he was Home Secretary.

Defeated at the general election of 1918, he re-entered Parliament in 1922, and became recognized as a leader of the "Asquithian" Liberals. From 1927 to 1930 he was Chairman of the Royal Commission which inquired into home rule for India, and the Report of the Commons, published in 1930, generally goes under his name. In 1931 he became Home Secretary in the National Government under Ramsay MacDonald. From 1931 to 1935 he was Foreign Secretary, and from 1937 to 1940 Chancellor of the Exchequer. Throughout he acted as leader of the "National Liberals."

In May 1940 he received a viscounty and became Lord Chancellor.

Sind, INDIA. Previously a division of the Bombay Presidency, Sind became a separate Governor's Province of British India in April, 1936. Half its population of 3,887,000 are engaged in agriculture and husbandry, and to improve the fertility of the land a great irrigation system has been created in the basin of the river Indus.

At Sukkur, in the centre of the Province, is the great mile long Lloyd Barrage. This was opened in 1932, and has increased the cultivable area of Sind by more than 5,000 square miles. On one of the mouths of the Indus delta is the seaport and airport of Karachi (population, 263,000), whence most of the grain, cotton, and oil seed of the Indian North-West is exported. The next largest town is Hyderabad (population, 81,000), not to be confused with the State and city of that name in southern central India. In the Province, notably at Mohenjo daro, is evidence of the life in the Indus valley some 5,000 years ago. The total area of Sind is 46,000 square miles.

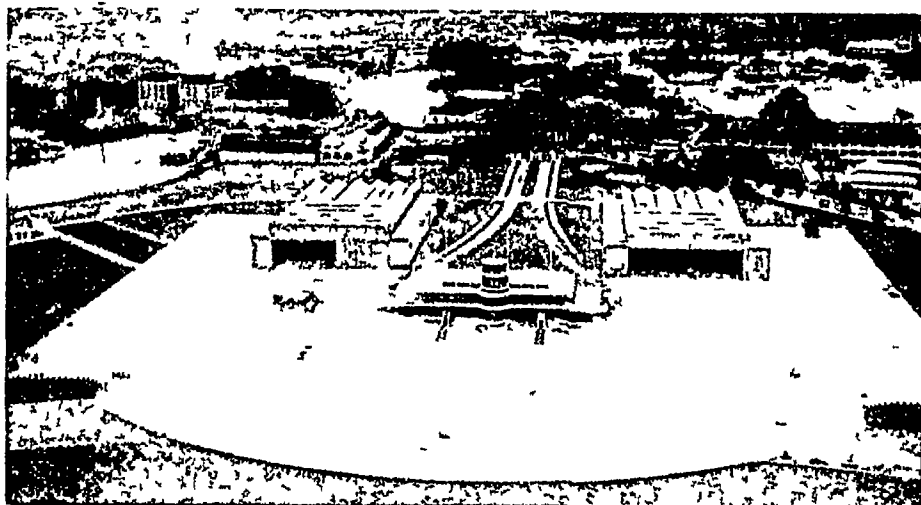
Singapore. (Pron sing-ga-pōr') Through the needle's eye of Malacca Strait is threaded the great trading route to the Far East, controlled at the tip of the Malay Peninsula by the island city of Singapore, lying about midway between India and China.

In Singapore harbour the great and small ocean liners, long lines of Chinese coaling-ships, Malay sampans, and curious Chinese sailing craft—an aggregate shipping of nearly 30,000,000 tons yearly. From some of the islands sprinkled over the pale green sea stare bristling rows of big guns, for the "Gibraltar of the East" is



SINGAPORE—BRITAIN'S GIBRALTAR OF THE EAST

Singapore, Britain's great commercial port in the East, has attained to still further importance since the inauguration there of the new naval base on February 14, 1938. Upon Singapore converges the sea traffic of half the world, and in the roads lies a changing multitude of vessels flying flags of all the nations. The photograph above shows the waterfront and Collyer Quay. The new naval and air bases are on the other side of the island.



SINGAPORE'S SPLENDID AIRPORT

Press Topics

Singapore's new \$1,000,000 airport was opened on June 13, 1937. Constructed to the latest designs, it stands on what was once a swamp similar to the one seen in the background of this photograph. Looking from the sea side of the landing ground, we see here the large hangars and terminal building.

not only the chief commercial centre of southern Asia and one of the most valuable of British minor possessions, but a naval base of great value. It is defended by 18-inch guns, some of the heaviest ever made.

A great new British naval base at Seletar, on the northern shores of Singapore Island, was officially opened in 1938. This includes the world's largest graving dock, named after King George VI. Adjoining is a base for Naval and Air Force aircraft, and on the south of the island, nearer the city, is a great international civilian airport, opened in 1937.

A huge 50,000-ton floating dock, built in England and towed 8,500 miles to Singapore, is capable of holding the largest battleship afloat. The cost of the base, aerodromes, and fortifications is estimated at nearly £20,000,000.

A splendid European hotel, named after Sir Thomas Stamford Raffles (*qv*), who colonized Singapore for the British Empire, faces the sea, and parks, clubs, and polo and cricket grounds help to reconcile European residents to the sultry climate of the tropics. All seasons are wet in Singapore; there are 182 rainy days in an average year. More than half Singapore's population is Chinese, but there is scarcely a colour, creed, caste, or nationality unrepresented. Red roads, on which all day long hungry-looking black Tamils sprinkle water from a pig-skin, gash the deep green of the thick shrubbery.

Singapore Island is only 217 square miles in area. The city is the seat of government for the British Crown Colony known as the Straits Settlements. The highest of the hills is called the Tin-hill, for Singapore lies in the region from which one-third of the world's tin comes, and tin-smelting is the chief industry. The city is connected with the Malay mainland by a

railway across the Straits of Johore. The population of the island is 651,000.

Siphon. If you fill a rubber tube with water, pinch the two ends to keep the water from escaping, put one end in a bucket of water on the table and the other in an empty bucket on the floor below, then release the ends, the water will flow up through the tube as it curves over the rim of the upper bucket and then down through

the tube into the lower bucket. Such a contrivance is called a siphon.

Gravity is pulling down on the water in both limbs of the tube, yet it flows up one side and down the other. Why? Atmospheric pressure does the trick—atmospheric pressure plus the difference in the weight of the two columns of water in the tube. When the water flows out of the lower end, atmospheric pressure on the water in the upper pail pushes it up to fill the vacuum that would otherwise occur at the top of the bend. The siphon will not raise water more than about 33 feet, because then the weight of the water equals the atmospheric pressure.

Siphons on a large scale are used in aqueducts to carry water across hills. The so-called "siphons" of soda water, etc., are not true siphons, for the water is forced out by the pressure of the gas. The early water clocks used the principle of the siphon to give a constant supply of water to drive the mechanism.

Sisal. (Pron *sis'-al* or *si'-sal*) Yucatan is the original home of the sisal or henequen plant and the chief place where it is cultivated, although some of the supply now comes from other portions of Mexico, as well as East Africa, Hawaii, and West Indies.

The sisal plant (*Agave rigida*) is a perennial which grows for a period of 8 to 25 years, being much like any other agave (*qv*). The fibre which comes from several distinct varieties of the plant is yellowish-white, lustrous, strong, and pliable. The sword-like leaves, which are from 3 to 5 feet long and as wide and thick as a man's hand, are not ready to cut until about the fifth year of their growth, and then only the bottom rows of mature leaves are cut each year. They are cut with a sharp knife, the sharp points being removed, and they are then tied

in bundles, crushed, and pounded to scrape away the pulp. The clean fibre is then hung up to dry.

At maturity the plant sends up a flower stalk, 10 to 20 feet high bearing dense flower clusters on a branching head. Besides the flowers small plants or bulbils are produced, and these fall on the ground to produce new plants, and then the parent plant dies. Fresh sprouts start from the dead stem of the old plant and new plantations are obtained by setting out either the sprouts or the plants arising from the bulbils.

The sisal plant requires a continuous warm, dry climate. It needs little care except for the cutting down of vegetation between the plant rows once or twice a year.

Sisyphus. (Pron sis'-i-fus) Among well-known figures in Greek mythology is that of Sisyphus, a king of Corinth who was an able ruler but a man filled with deceitfulness and avarice. From the time of Homer he was renowned as the craftiest of mortals, by some later writers he is said to have been the father of Odysseus (*q v*)—the crafty father of a crafty son. Either for his many iniquities, or else because he betrayed the secrets of the gods, King Sisyphus was condemned after death perpetually to push up hill an enormous stone, which as soon as it reached the top always rolled down to the bottom.

Skate. This is one of the strangest of fish, for though it is flattened like a true flat-fish, it has the habits of the sharks. With the latter, the skates and rays form the group of cartilaginous fishes, as opposed to the bony fishes which include the better known sorts (*See Fish*). The skates and rays are as a rule, more or less diamond-shaped and quite flat, with a pointed snout and a long, often whip-like tail. The body is of normal shape, and the two lateral angles of the diamond are really the fins. The eyes are on the upper side of the head, and the mouth on the underside—the flattening being done from above and not from the side as in the true flat-fish, so that there is no need for one of the eyes to twist round as in those creatures (*See Flat-fish*).

The common skate (*Raja batis*), taken as typical of the whole group, is a deep sea fish, often of very large size, being seven feet wide

across the broadest part—the way in which these fish are usually measured. Along the middle of the back and tail it has a number of hooked spines. Spines, indeed, are found on most of these fish—some, such as the thornback ray (*R. clavata*), having several rows of them.

Very curious fish of this type are the electric rays of which the common electric ray, or torpedo (*Torpedo marmorata*), occurs off our shores. These fish have 'electric' organs situated in the forepart of the body, by which powerful shocks can be given at the rate of 150 per second.



CUTTING LEAVES FROM THE SISAL PLANT

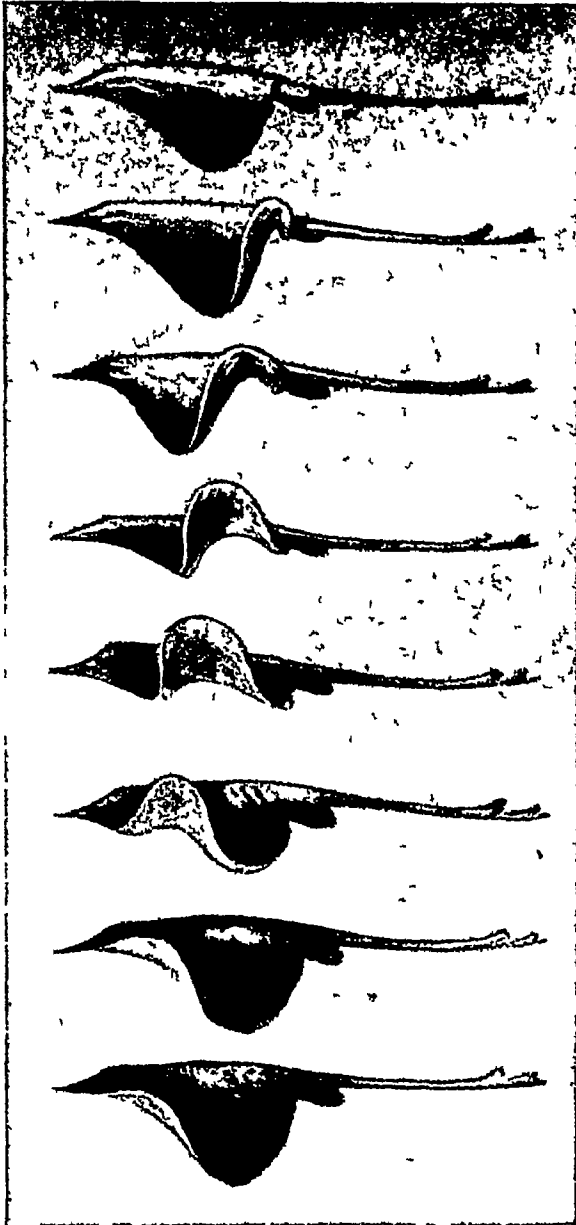
The rope fibre known as sisal hemp is made from the large leaves of a species of agave called the sisal or henequen plant. Above Mexican labourers are seen cutting the leaves which will be taken to special cleaning machines the scraping wheels of which separate the softer parts from the fibre.

Photo Publishers Photo Service

They are for self-defence, or to stun or kill the fish's prey. The electric ray is rounded rather than diamond shaped, and in this it resembles another strange creature, the monk- or angel-fish (*Rhina squatina*), which is not so broad as the electric ray, and has very large fins, it is not completely flattened, but in form comes between the sharks and the rays. The saw fish (*q v*) belongs to yet another closely related group.

The Voracious Devil-fish

The largest of the rays—which are superficially distinguished from the skates by having a short instead of a long snout—are the "devil-fish," which may be 20 feet in width. In some of these the pectoral fins extend forwards like a pair of great horns. Below the mouth they join and make a large shovel-like area, which is



HOW A SKATE SWIMS

These eight drawings show the method in which the skate uses its lateral portions while swimming. The movement is begun in the rear portion of the pectoral fin and body, and continues in a forward direction.

used by the monsters to scoop up whole shoals of small fish. A big devil-fish may weigh as much as several tons.

The flesh of the common skate especially is considered very good eating, and although it is most usually served in "fish-and-chip" shops, it is one of the most expensive types on the market. Enormous amounts are landed annually by British trawlers.

Skating. Health-giving and exhilarating, and certainly the most graceful of all sports, to the excusably nervous and awkward beginner ice-skating is merely the most difficult thing that he or she has ever tried. And until the natural movements are learned, it seems easier to fall down than stand up, and actually to move is almost unthinkable!

The observance of a few simple rules will soon bring confidence and real enjoyment. These include (1) turning out the toes, (2) keeping the weight of the body to the front and inside the feet, (3) letting one foot complete its stride before the next is begun, and (4) above all, keeping the ankles stiff and firm.

The "inside edge" is the first thing to learn. This is the basis of ordinary skating and its application to games like ice hockey (q v). The main principle is to keep only one foot on the ice at a time, and, also, to make as long a stride as is practicable—at least five yards. The figure described by the inside edge of the skate is a very slight curve inwards, and the skater's course is thus really a succession of zigzags. Stopping is effected by leaning heavily on the heel, or by turning the toes in.

As he reaches real proficiency, the skater can turn to speed-skating or figure-skating, which includes ice-dancing, jumping and similar accomplishments. The foundation of figure-skating are the turns towards and away from the centre. Every variation has its particular name—rockers, counters, brackets, threes, etc. It is essential to learn the "outside edge," which involves putting the weight of the body on the



Short & General

SKATING ON THE FENS

The Fen country may be regarded as the nursery of English skating, since it is the only district in which really large stretches of ice are frequently available in winter. When conditions are favourable, championships are held on the Lincolnshire Fens, and above we see a heat in progress.

outer of the two edges of the skate This means that the latter describes an outward curve, and that the balance of the body must be distributed unnaturally (See illustration in page 3228)

The provision of big indoor stadiums in Britain has meant an amazing growth in the popularity of skating and an all round improvement of standard. The world's speed championships are usually won by representatives of the Scandinavian countries, the real home of skating, but in recent years the figure-skating world has seen its "Ice Queen," the Norwegian Sonia Henje, succeeded in turn as world champion by two British girls, Cecilia Colledge and Megan Taylor British man skaters and "mixed pairs" have also reached a high standard, but it is an acknowledged fact that women the world over usually make better skaters than do men The "nursery" of speed skating in England, it may be noted, is the Fen country, where the long-distance championships are held when conditions permit

Although the great enthusiasm with which roller skating was first hailed in this country has almost died out, there are still numerous adherents of this type of skating Much greater energy must be expended than in ice-skating to achieve the same result, for not only is the roller skate, with its four ball bearing wheels, a rather heavy attachment, but the cement or wooden rink is not so fast a surface as is ice Rink hockey is a team game corresponding to ice hockey

Skeleton. When we build an engine we always start with a rigid framework to which the moving parts are fastened The more powerful our engine, the stronger and more solid must be the foundation

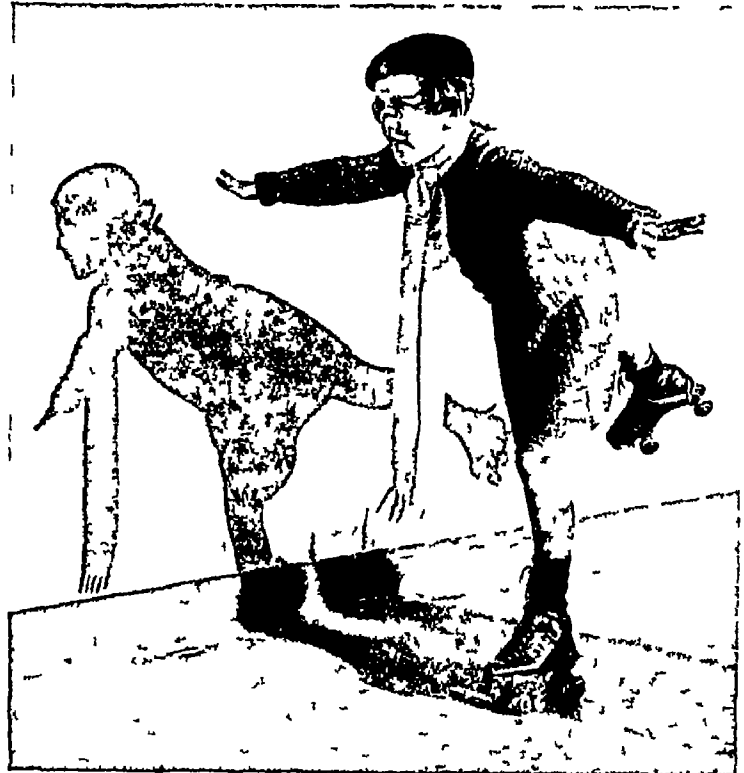
It is the same with the living engines of the animal world They require a framework to support their lung-carburettors, their heart valves, and their stomach cylinders, and they must have a foundation from which their arm pistons and walking-beams can be thrust out The framework upon which animals are built is called the "skeleton"

Some animals, like the lobster and the crab, the oyster and the beetle, wear most of their skeletons on the outside, although even they have often a series of supporting stays which cross the inside of the body Water creatures, as a rule, do not need such a strong framework, for they are surrounded and supported on all sides by the water in which they live Some, like the octopus and cuttle fish, get along with

nothing but one gristly or chalky bone, but they are usually slow and helpless on land So essential, however, is the skeleton to active life that all the higher forms of animals, those classified as *vertebrates*, are creatures with back-bones Of these, Man is the highest, with the most highly-developed skeleton (See page 175)

The human skeleton is composed of about 200 bones, each of which is adapted to its place and duty The foundation of our body structure is the backbone or spinal column, which consists of 24 movable bones called "vertebrae"

There is a pad or cartilage between each two vertebrae, forming an elastic cushion and



Fox Photos

YOUTHFUL EXPERT ON ROLLER-SKATES

About the year 1920 a craze for roller-skating swept over England, and rinks were built everywhere The enthusiasm soon died down among the adult population, but among children it still persists, often to the dismay of pedestrians, for the pavement has now taken the place of the indoor rink.

permitting a slight motion The skull is set on top of the vertebral column. About 20 bones form the skull, these being more distinct in early life because some of the parts unite gradually as life advances

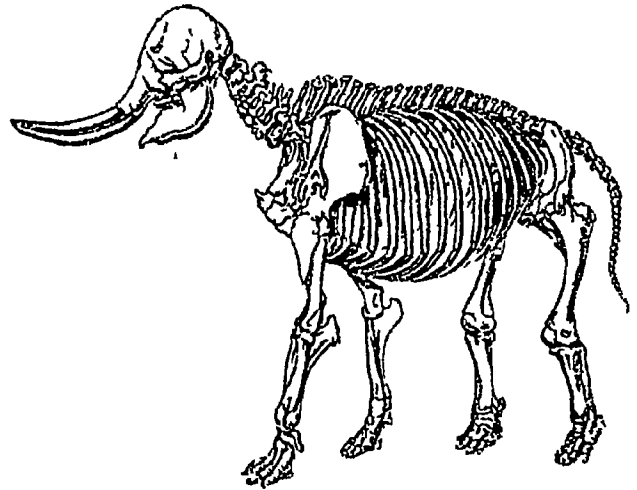
Bony Framework of the Trunk

Twenty-four ribs, 12 on each side, bound the chest, most of these are connected by cartilage to the breast-bone The "shoulder girdle" (the "pectoral girdle" of other animals) consisting of the shoulder-blade and collar-bone, supports the arm At the lower end of the backbone is the "pelvis," a strong bony ring composed in the young of six separate bones, but later uniting to form only two To the pelvis the



Sparrow Hawk

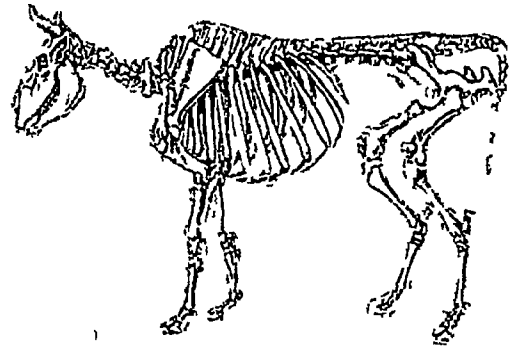
Kangaroo



Elephant



Common Perch



Cow

SKELETONS OF FIVE MEMBERS OF THE BACKBONED TRIBE

"Nature," says Emerson "plays one tune to infinite variations." Here we see illustrations of the many "tunes" that she has played on the idea of the backbone. To the backbone of the sparrow-hawk she attached wings and so made a bird of the air. In the picture of the kangaroo, note the relative size of the front and hind legs. Even if we had never seen a kangaroo the skeleton would tell us that it did not walk on all fours. The elephant and the cow have a somewhat similar anatomy, since they are both mammals, and a similar cumbersome dragging gait since neither is a hunter. But the perch might say "We fish are the grandfathers of them all," for Nature's great discovery of the backbone was made in the life of the water.

legs are attached. The bones of the skeleton are held together by strong bands of connective tissue called ligaments. It is the tearing out of ligaments that constitutes the essential injury of a bad sprain.

Ski-ing. (Pron shē'-ing or skē'-ing) For hundreds of years skis (long, narrow pieces of wood, pointed and bent upwards at the front) had been used in Scandinavia and other northern Old World lands for getting about in winter over the deep snow. About 1870, however, someone had the idea of adapting this merely useful contrivance to sport, and twenty years or so later ski-ing was already becoming popular in the Alps, the Black Forest, and Tirol. The Austrians, especially, took to ski-ing, and so did the English, through the work of Arnold Lunn, the sport's greatest prophet in England. Now Austrian children can ski almost as soon as they can walk, and thousands of English, Dutch, Danish, and French people visit the Alps, Tirol, and Norway every year to learn how to ski.

In ski-ing one very important thing is to see that your skis are the right length, if you stand upright, with one arm stretched above your head, the tip of the ski, when stood on end, should be about level with the palm of your hand. The longer your skis, the more difficult they are to control but the less likely you are to fall over, and vice versa. Besides skis, you have ski sticks, usually of hazel or cane, when upright, they should come about up to your armpits. A few inches above the bottom of the stick, which has a ferrule, there is a ring of cane or metal attached by a series of pieces of leather, like the spokes of a wheel. This acts as a support to stop the stick sinking into the snow.

In progressing on skis on the level, you take as long a stride as is comfortable, pushing yourself along with the skis close together, keep your elbows well in and put in the sticks as close to your skis as possible. In this way, too, you can tackle a gentle slope, or go cross-wise up a steep one. You can walk up a steep

SKI-ING

slope by "herring boning," that is, turning your skis outwards and stamping them down, with the upper edge against the slope, so that you leave a "herring bone" pattern behind you, or you can go up sideways, edging your skis into the snow. But getting uphill is made much easier if you have strips of seal skin fastened on the underside of the skis, for these grip the snow easily. You can also wax your skis with blobs of stiff "climbing" wax.

Once up, you must come down. In straight running, one ski is held slightly in front of the other, and they are nine inches or so apart, if they are not parallel you will start to turn and at first will probably capsize. You can stand more or less upright, or crouch right down, it makes little difference so long as you keep your knees very supple, and bend them loosely when you come to a bump or alteration in the level of the ground. It is best to run at first gently across a slight slope, as there is then little danger of your getting out of control. When running across a gentle slope, the upper ski should always lead, the weight being on the lower one. Later you can take things straighter and more steeply. Lean more forward the faster you go.

How to Stop and Turn

To stop, you execute what is called a "snow-plough." This is done by turning your heels outwards, and toes inwards, when the inner edges of your skis will also be digging into the snow, your knees should be well bent. This forces the snow out in front of you, and brings you to a halt. If your weight is more on the right foot than the left, you will find yourself beginning to turn to the left, and vice versa. By thus distributing your weight, you can start making a *stem* turn, the simplest skiing turn, suited to soft snow and gentle gradients. This is, however, a very slow turn, and is not much used in actual practice. Its logical development leads to the *stem bogen*, a very useful turn. This is done from straight running, the skis being held close together. For a left turn, the right ski is stemmed outwards, the weight being on the left ski. Then the weight is transferred to the right ski, the right knee being bent. As you come round, the left ski is put parallel with the right one, and slightly in front.

From this again is developed the most generally useful skiing turn, the *stem Christiania*. In this, the outer ski is again stemmed, but the weight is shifted more rapidly, with a swing of the hips and shoulders. At the end of a perfect "stem-christy" to the left, for example, the skis are close together and quite parallel, the right shoulder should be forward and turned towards the left, the knees well bent. The most usual fault is that the shoulder position is wrong, and the skis are far apart owing to not

getting all the weight on to the outer foot. In transferring the weight, the knees are straightened, then bent again, and in the timing of this action lies much of the art.

The pure *Christiania* or *parallel swing* is done direct from a straight-running position. The skis are close together the whole time, the left turn is done by a swing, from the left to the right, turning the shoulders also in such a way that the right one leads at the end of the turn, the upper (left) ski being then in front. The skis are edged more or less into the hill-side according to the rapidity with which it is desired to stop. This turn can be done, like the stem *Christiania* at high speed on the hardest of snow, either for changing direction or for stopping. It can be used for the same purposes in soft snow, at a fairly fast speed. But in Scandinavia and in Switzerland the *Telemark* turn is used in soft snow. In this, the skis are close together, as always for running



'HERRING BONING' ON SKIS

This method of climbing on skis gets its name from the pattern the skier leaves behind him. Although somewhat laborious at first it becomes easier with practice and is the quickest method of climbing a steep slope under ordinary conditions.

downhill, and one—that on the side opposite which the turn is being made—is thrust forward. It is also stemmed slightly outwards, and edged, the weight being more on the inner ski. The inner knee is bent forward, so that the position is a very low one, and the skier is swung round in a graceful, wide turn. In soft snow no turn is so spectacular as a well-executed telemark.

The *jump* turn is another very spectacular type, but one can only be done on soft snow, and at a fair speed, it is a useful method of turning in bad, sticky snow when any attempt at sliding turns of the usual type would probably fail. Before making a jump turn, you take up a crouching position on your skis, then, planting the stick firmly a foot or more ahead of your ski, on the side to which you want to turn, you jump, lifting the knees well up, keeping the skis as close together as possible. The stick acts as a pivot and round you go. This turn is also useful to stop dead when you are running on soft snow and come suddenly against a hidden danger. Jumps, too, using both sticks together, are useful for clearing small objects on a cross-country trip, but only the advanced skier makes much use of them.

Racing on skis is a tremendously exciting, strenuous, and at times dangerous, sport. The types of race are the *langlauf*, a regular long-distance cross-country race, with up-and-down-hill sections, the *slalom*, a timed race over a given course, fairly short and steep but with numerous sudden turns marked by flags, and the downhill race, in which the competitors have to come down from a given start to a given finish, by whatever course they like. Often this cannot be chosen direct, for it may include places so steep that no normal skier will be able to tackle them. Sometimes, too, there are *no-fall* races, in which the man who is steady but

not spectacular wins against the speedy man who falls often. Finally, there is *ski-jumping*, which means sailing far out over a virtual precipice, and landing, at tremendous speeds, on a steep slope of frozen snow, down which you hurtle at sixty miles an hour or more. Most big winter-sports resorts have a jump, but only the experts can tackle this. Ski-joring is the sport of being towed on skis behind a running horse.

(See also Winter Sports)

Skin. Human skin is composed of two main layers, the "epidermis" or "scarf" skin outside, and the "dermis" or true skin underneath. The true skin is studded and ridged with tiny projections above, the scarf skin is correspondingly pitted and furrowed underneath, and the two fit together like the parts of a puzzle. On the palms of the hand and the soles of the feet these ridges become so prominent that the upper surface of the epidermis is ridged and furrowed in patterns which are unique for each individual, so that each person's finger-print is an authentic "signal."

Two sets of glands pour their secretions over the skin. The flask-shaped sebaceous glands, situated deep in the true skin and usually associated with the hairs, occur practically all over the body, except on the palms and soles. In health their only semi-fluid secretion lubricates both the skin and the hair.

The sweat glands are set still deeper, and reach the surface through crooked ducts, twisted like a corkscrew where the outer epidermis is thick and horny. They are scattered all over the body, being most numerous in the places from which the sebaceous glands are absent—the palms and soles.

The skin performs a threefold function (1) It protects the delicate body tissues from injuries, being especially thick, hard, and



Fox Photos

A SKIER IN ACTION

Zigzagging down the hill-side, this skier has just executed a fast turn to the left in the soft powdery snow, ideal for this sport. Notice the way he uses his sticks to balance himself. Above him are the tracks of other ski-runners who have made similar turns.

cushioned with fat where it is subject to constant knocks and pressure, as on the soles, and far more delicate and elastic over the joints (2) Much news of the outer world reaches us in the form of sensations of touch, heat and cold, pain, etc., through the special sense organs in the skin. Many of the tiny protuberances (called "papillae") on the upper surface of the dermis contain nerve endings, these "tactile papillae" are especially numerous over the soles and palms (See Touch) (3) The skin keeps in the body heat, and also, when necessary, reduces the temperature through the evaporation of the perspiration. In summer the sweat glands are more active than in winter, this keeps the body temperature normal in a heated atmosphere.

Skittles. In this very ancient game, played today in some of our inns just as it has been for generations, a flat-sided wooden ball called the "cheese" is thrown at the ninepins at the far end of the skittle alley.

The player stands about 6 or 8 yards from the pins and tries either to knock down as many as possible in an agreed number of throws, or to knock down the lot in the fewest throws. There are several variations in the game and its scoring, and even in the number of pins used. A general rule is that a player is allowed one step forward when throwing.

Skunk. Many a story is told of persons who have ignorantly or carelessly disturbed one of these creatures and then have had to burn or bury their clothes to get rid of the horrible odour. For of all animals the skunk has the worst smell, due to the secretion of certain glands, and designed as a protection against its enemies. There are several species of skunk, all found only in the New World. The common skunk (*Mephitis mephitis*) is about the size of a cat, and ranges from Hudson Bay to Guatemala. The body is rather stout, the tail very bushy, and the colour black, with broad stripes of white running lengthwise from the head, this coloration is in the nature of a warning, which other creatures respect.

Skunks burrow and are most active at night. They feed on insects, mice, and other small animals, and birds' eggs. Sometimes they rob hens' nests, but this is by no means the rule. On

the other hand, they benefit the farmer by destroying a large number of beetles, grasshoppers, and field mice.

Ordinarily they do not run at the approach of Man, but, conscious of the protection of their evil-smelling secretion, move away deliberately. They can eject this fluid at will to a distance of 8 or 12 feet. Daring persons sometimes succeed in taming them, so that they may be stroked and petted without ill results. Skunks often come close to camps and outlying dwellings, and a pair may even take up their abode in a barn or porch. The flesh is said to be white and sweet. The fur of the skunk is extensively used and is valuable enough for these creatures to have been farmed successfully, it sometimes goes under the name of "Alaska sable." Special treatment relieves the fur of all unpleasant odour.



THE SKUNK LOOKS NICER THAN HE IS

There are several species of skunk, and here you see the little skunk, one of the most handsome of these creatures. Notice the brilliant contrast of white and black in his fur—one of Nature's warning signals, for the skunk has a terrible smell.

Slang. There is a "vagabond language"—wild, free, racy, often vulgar—which refuses to follow the usual standards established by the best writers and speakers. We call it slang.

At its worst the use of slang tends to vulgarize one's speech, to limit one's vocabulary by driving out the more reputable words. It leads one to look for expressions that are in themselves striking or "different," rather than those which convey the exact shade of meaning. The slangy person whose adjectives are limited to

"rotten," "tophole," "posh," and "stunning" finds himself at a loss when he attempts to describe a thing accurately.

At its best, slang lends spice to language. Most slang expressions are short-lived, but in every age there are some of these vagabond words which are, as it were, admitted into respectable society and become part of the standard language. Had our forefathers never used slang, the English language would be much poorer. "Blizzard," "mob," "humbug," and "banter" were originally slang expressions. "Squelch" was found to be so convenient and expressive a word that it has recently been admitted into good usage, and perhaps in the same way our word "swat," which the anti fly campaign has made so popular, will before very long appear in our dictionaries without the label "slang." So "bluff" (to deceive by a confident manner), "swindle,"

and "knock-out" are well on the road to respectability, and even "de-bunk" (to expose a pretentious person, or rid of sentiment) is accepted in literature

Originally regarded as the language of the criminal and vagrant classes and often springing from their jargon, or *argot*, as the French call it, slang has invaded almost every walk of life and almost every class or profession has its own expressions. The student speaks of "swotting" or "cramming" for an "exam," and of being "ploughed" when he fails in it. The actor waits to "see the ghost walk" (get his salary). The theatrical manager hopes the play will be a "hit" and "get across" to the public. The artist complains that his picture has been "skied" (hung too high in an

without any understanding in England of their real meaning

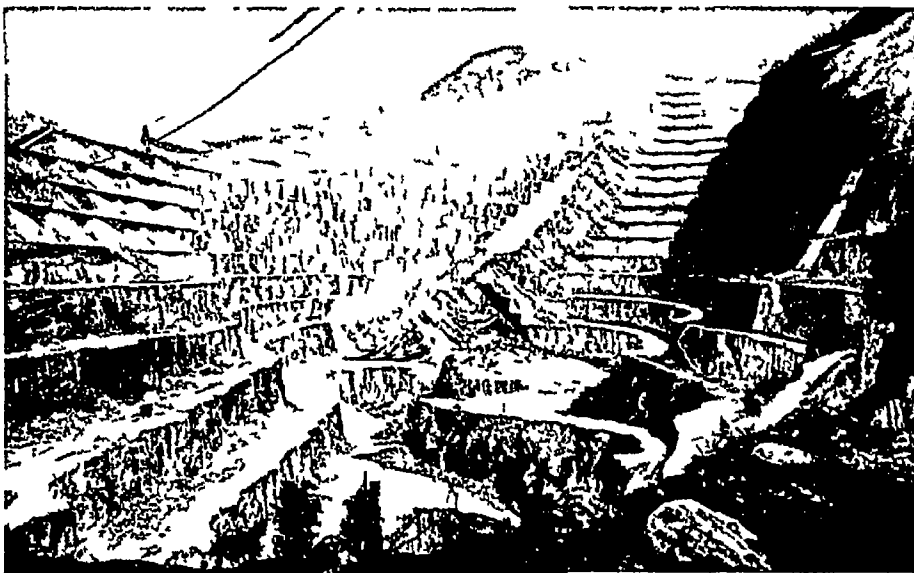
Slate. This dark grey (sometimes blue, greenish, purplish, or even red) stone is widely used for roofing, blackboards, billiard-tables, slate-pencils, writing-slates, etc. Slate possesses the property of splitting into thin slabs or leaves.

To the geologist, slate is a metamorphic aqueous rock. This means that it was first deposited by water as a bed of clay, but has undergone changes in its character due to the conditions since it was laid down. It has actually been compressed by tremendous force, so as to spread it out and produce planes in which it splits at right angles to the direction of the pressure exerted.

This tendency to split into thin slabs is

so characteristic of slate that the name is sometimes applied to other rocks which split in this manner. Good-quality slate is not widely distributed. The best European slate comes from North Wales.

Slavery AND SERFDOM Go back as far as we may, we find the slave in all countries. We see him in Egypt toiling to build the pyramids, we meet him in Babylon, and early in Jewish history we see Joseph being taken from the pit and sold by his brothers. For more than a thousand



MILE LONG SLATE QUARRY IN WALES

This is a portion of one of the great slate quarries of North Wales, at Penrhyn. The slates are cut up into sizes known as "princesses," "duchesses," "countesses" and "ladies," varying from 24 inches by 14 inches to 9 inches by 6 inches. Slates are usually grey-black to blue-black in colour, though green, red, and mottled varieties are found. One of the most distinctive properties of slate is the ease with which it can be split into thin sheets.

Geological Survey and Museum

exhibition) The business man looks for a "slump" in the market if the "bears" triumph over the "bulls."

The World War brought into use a large number of new words, among them many vigorous slang expressions. "Tommy," "poilu," "doughboy," and "boche" or "Jerries" and "Fritzes" were the terms adopted for the British, French, American and German soldiers, respectively. The title "ace" was given to an aviator who had brought down a number of enemy planes. "Blighty" was the British soldier's term for home, to "go west" his figurative expression for death.

In general, slang is a bad thing and should be avoided, particularly if it is merely borrowed from some other country—like the Americanisms, learnt from the talking films, that have permeated the English language and are used

years slavery held sway in Greece and Rome.

Slavery began even before Man gave up his wandering pastoral life and settled down to till the soil. As an act of mercy the vanquished of the battlefield, with their wives and children, were made slaves rather than put to death. Sometimes men became slaves through inability to pay their debts, others were reduced to slavery by judicial sentence, among the ancient Germans men at times gambled away their freedom at games of chance.

After the barbarian invasions of the 5th and 6th centuries A.D. chattel slavery (as it was called) gradually died out and was replaced by serfdom. The serf was not the chattel or "thing" of his master, he was a person, although of inferior rank. Like the free peasant (villein), the serf held and tilled a few scattered acres of land from the lord of the manor, for which he paid

SLAVERY

various dues and rendered two or three days' work a week on the land, which the lord still kept in his own hand. But, unlike the free peasant, the serf was "bound to the soil" and could not leave his master's estate.

In England serfdom died out soon after the great Peasant Revolt of 1381, but in certain parts of France it lasted until the French Revolution. In Prussian Germany serfs were not freed until the beginning of the 19th century, and in Russia the great step which emancipated 23,000,000 serfs by imperial edict was not taken until 1861.

In the 15th century the Portuguese began to introduce African slaves taken by the expeditions which they were pushing down the West African coast. In the New World slavery was revived with all its ancient horrors, to work the mines and till the land. At first the Spaniards tried to enslave the Indians, but they gradually dwindled under the unwholesome conditions. Negro slaves were then imported from Africa and proved equal to the tasks. From the West Indies slavery passed to the mainland, and in course of time slave labour was considered indispensable on the great tobacco, sugar cane, and cotton plantations throughout the southern states of America.

The demand for slave labour became so great that it is estimated that between 1680 and 1786 more than 2,000,000 slaves were brought into the West Indies, the English colonies, and the North American mainland.

But as the true nature of this traffic came to the knowledge of Europeans it outraged everyone.

The first stage towards the abolition of slavery was the prohibition of the trade in slaves between Africa and America. To Denmark belongs the honour of being the first Western nation to abolish the slave trade, in 1792, that example was followed by England in 1807, and the United States in 1808.

This left the question of the slaves still in bondage to be solved. In England an agitation led by William Wilberforce resulted, a month after his death in 1833, in the passing of a Bill emancipating all the slaves in the British Colonies and appropriating a sum of £20,000,000 to compensate their owners.

In the United States the struggle between the slave and free states was long and bitter. Stirred by "Uncle Tom's Cabin" and other anti-slavery literature, people of the Northern states systematically did all they could to help negro



CELEBRATING SLAVERY'S ABOLITION

At midnight on the last day of July 1834, Lord Stanley's Bill, abolishing slavery in the British Empire, became law. This contemporary drawing reflects the jubilation on the morrow of the anti-slavery agitators. Actually, emancipation was not, at first, an unmixed blessing the negroes taking time to learn the proper use of freedom.

From Madden "West Indies" 1835

slaves to escape. This practice was one of the grievances of the South against the North. When the Civil War finally came, President Lincoln in 1863 issued his famous Emancipation Proclamation, and in 1865 a constitutional amendment prohibited slavery for ever.

The fight against slavery is, however, not yet over. In some parts of the British Empire customs have long existed which have brought about conditions little different from slavery and great difficulty has been experienced in suppressing them. For instance, in Hong Kong and Malaya the *Mui Tsai* system has allowed girls under 12 years of age to be handed over by their parents to an employer as domestic servants in consideration of a lump sum of money. It was contended that these children were virtually sold into slavery, but it was not until after a prolonged agitation that a Commission was appointed to inquire into the system. In 1937 the Commission made certain recommendations.



CHAINED SLAVES IN A 'FREE' REPUBLIC

Isn't it extraordinary that a system of slavery has been established by free-born descendants of emancipated slaves in a State expressly founded to be the home of the free? The photograph above, smuggled out of Liberia in 1930, shows how the natives were secured by collar and chains for forced labour. As a result of an International Commission on Slavery and Forced Labour this state of affairs is now being remedied.

Photo Ewing Galloway

dealing with the system, among them being the prohibition by law of the employment of girls under 12 years of age as domestic servants.

In Abyssinia slavery existed until the Italian conquest, though in 1932 the Emperor had taken measures to ensure its suppression within twenty years.

Slavery still persists, too, amongst some of the tribes of North Africa and the Arabian peninsula, and Arab *dhow*s still convey a human freight across the Red Sea—men and women, boys and girls, seized or bought by Arab slave-traders from African villages for dispatch to purchasers in Arabia. But the *dhow*s generally make their journeys at night, for the British Navy maintains a close watch on both coasts of the Red Sea and pounces on the slavers whenever it gets the chance.

Slavs. (Pron *slahvz*) Estimates of the total number of Slavs vary from 140,000,000 to 172,000,000. They far outnumber any other European racial division, as judged by the language test. They are members of the Aryan or Indo-European family of peoples, and are generally a broad-headed (brachycephalic) race, sometimes fair, though never so fair as the typical blond Teuton, and sometimes dark. The type, however, has been blurred by many racial crossings. Their name has been derived from a word meaning "glory," and our word "slave" is believed to have been originally a national name, meaning a bondman of Slavonic race.

When the Slavs first emerged from obscurity, in the early centuries of the Christian era, their tribes were found to the north-east of the Carpathians, between the Oder and the Dneiper. From this original centre they were pushed back on the north and west by Baltic and Teutonic tribes, overrun by successive invasions from Asia, and churned by migration and conflict into many separate nationalities.

The Poles, the most individual and masterful of the Slavic nations, declined in power through their turbulent and undisciplined aristocracy, and were dismembered in three great partitions at the close of the 18th century (See Poland). The vast empire of Russia became one of the "six Great Powers." Serbia, Bulgaria, and Montenegro had to battle for existence against the Turks since the 14th century. While Montenegro successfully resisted Ottoman conquest, the two former achieved independence only in the 19th century.

The eastern Slavs of Russia and, in the main, the southern Slavs of the

Balkan peninsula adhere to the Orthodox Eastern Church, and use the Cyrillic alphabet, a modified form of the Greek alphabet. The western Slavs—the Croats, Poles, and Bohemians especially—were Christianized from Rome, and still adhere to the Roman Catholic Church, and use the Latin alphabet.

The Slavic peoples in a sense are the backward nations of Europe, retarded partly by their own characteristics and partly by unfavourable circumstances. Brave and brilliant, the military Slavic nations were too jealously individualistic to submit to discipline and learn the value of union. The eastern and western Slavs exhausted much of their energy in fighting against each other. The geographical position of the Slavic nations was also unfavourable, for it made them the great breakwater of Europe against Asiatic conquest.

But, although politically and industrially backward, the Slavs have special gifts in literature and art, as witness the great names of Tolstoy and Turgenev in literature, of Chopin, Dvořák, and Tchaikovsky in music, of Makovsky, Vereshchagin, and Mucha in painting.

Sleep. During the day the substances of the body are used up faster than they can be repaired. This is true not only of the muscles, by which all movements are carried on, but also of the brain, which directs the motions and receives the impressions that come from the eyes, ears, and other sense organs. The brain especially needs to be repaired, for without it

SLEEP

all the rest of the body would be of little account. So the thinking machine stops work. That is sleep.

A strong sensory impulse may be able to break in and set the machine going. For example, a loud noise or a strong shake may wake one up. If a person eats too much of the wrong food, especially for supper, he has indigestion, and the nerves from the stomach may be stimulated and send strong impulses to the brain. In such circumstances sleep is likely to be poor, and bad dreams may result.

Dreams are due to the fact that certain regions of the brain are not resting. In dreams "common sense" is off duty. The memory connexions are made in an irregular manner. Thus dreams are unreal and often deal with impossibilities. They are like our imaginings and ideas when awake, except that they are not kept in order.

Sleep may be more or less sound. It is soundest for the first hour or two. After that the soundness rapidly decreases. This can be determined by finding out how loud a noise is necessary to wake a person at various times.

While the big brain, the *cerebrum*, is largely out of commission in sleep, many of the automatic subordinate centres continue active. Respiration goes on, though more slowly. The heart beats more slowly. Many reflexes are active. A person who is asleep will pull away his foot when it is tickled. But he knows nothing about it, for the knowing part is off duty.

Every organ needs most blood when it is in action. The brain is no exception. During sleep it receives little blood. We say it is "anaemic." One of the earliest signs of waking is the appearance of more blood in the brain. People in other conditions than sleep may become unconscious from too little blood in the brain, as in fainting.

Some scientists believe that the withdrawal of blood from the brain is the cause of sleep. Others think that the anaemia of the brain is a result, rather than the cause of sleep. Most adults need about eight hours of sleep in twenty-four, but children need considerably more.

Slide-rule. Engineers, scientists, and mathematicians having much calculating to do often use an ingenious instrument called the slide rule. The article on Logarithms tells how adding the "logarithms" of two numbers gives you the logarithm of their product, while division is done by subtracting logarithms. These facts are used in the slide rule.

As usually constructed, the slide rule looks like a ruler, except that it has a sliding scale along its centre, with fixed scales on either side. Surrounding this assembly is a transparent, sliding "cursor" with a hair line, to aid in reading crosswise from scale to scale. Each

SLOTH

scale is marked with numbers from 1 to 100 with divisions between, but instead of being spaced evenly the numbers are spaced according to the values of their logarithms. The interval between 1 and 2, for example, on one scale is equal to that between 10 and 20 on the other.

Suppose, now, we want to multiply 5 and 3. We place the figure 1 of the sliding scale opposite 5 of the fixed scale. Now, opposite 3 on the sliding scale will be 15 of the fixed scale, this being our answer.

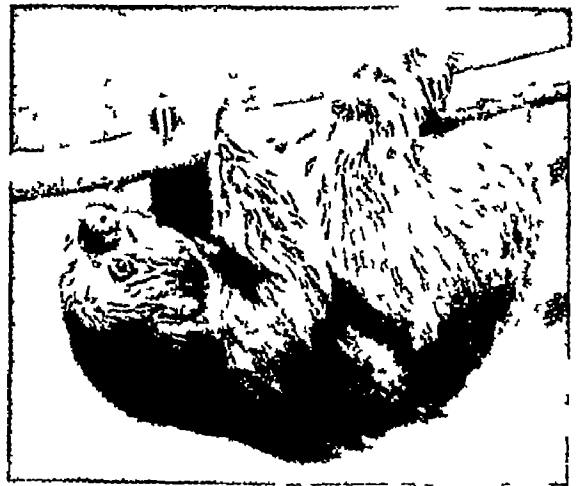
The longer the slide rule, the greater its accuracy. By winding the scales round a cylinder, slide rules up to 83 feet in length have been made. (See Calculating Machines)

Sligo, County of Eire. On the west coast of Eire lies this very beautiful and historic county, 707 square miles in extent and supporting a population of 67,000. The industries comprise cattle grazing, fishing, and the growing of oats and potatoes.

The county town (population, 11,000) is Sligo. Among the several picturesque lakes is Lough Gill, in which is the "Lake Isle of Innisfree," made famous in poetry by W. B. Yeats.

Sloth. These curious animals derive their name from the fact that they appear lazy and sluggish in movement, though at times they show considerable agility. They live in the forests of Central and South America, spending their lives in the trees, by means of their hooked claws they cling upside-down to the branches, and on the ground they can get about only with difficulty.

There are two types of sloths—the three-toed sloth (*Bradypus*) and the two-toed sloth (*Choloepus*)—and they belong to the strange collection of creatures called Edentates. Both are covered with long coarse hair, the shafts of which are roughened or fluted. This hair is



THE CURIOUS TWO TOED SLOTH

How would you like to spend your life hanging upside-down? That is what the two-toed sloth does. He moves about so slowly, too, that he is often covered with green algae, which help to disguise him in his forest home.

SMELL

naturally greyish, but in the damp forest it becomes covered with a growth of algae, imparting a peculiar greenish colour, which makes the animal difficult to distinguish among the foliage. In dry climates the algae disappear (See illustration, page 2633)

Smell. An excessively small amount of substance is needed to stimulate the nerve endings in the nasal passages. Some substances can be detected if as little as one thirty-billionth part by weight is present in a given weight of air.

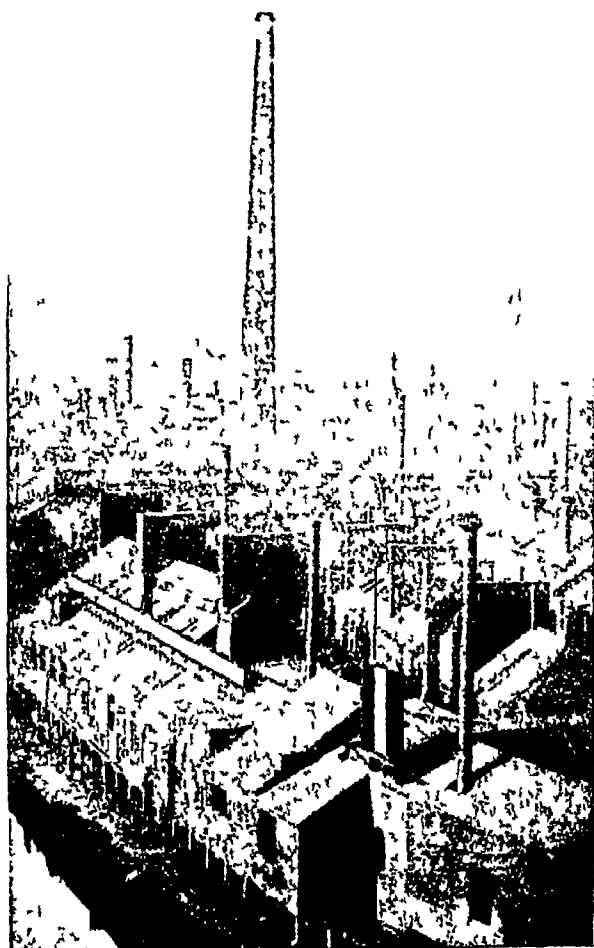
Smell is closely related to taste, each sense being aroused by chemical substances coming in contact with the nerve endings. In the case of smell the substance must be in the form of a gas. Gases diffuse through the air, and consequently we can recognize things at a distance by their odour.

The sense of smell is closely connected with the sense of taste, as is proved by the fact that a common cold which deprives us of our sense of smell also affects our taste.

SMOKE

Smith, ADAM (1723-1790) The greatest of British economists, Adam Smith was born at Kirkcaldy, June 5 1723, and after being educated at Glasgow and Oxford he became professor of logic at Glasgow University in 1752. He gave up that post in 1763 to travel abroad, and in 1766 settled down to study and write. His book, "The Wealth of Nations"—the result of ten years' work—was published in 1776, and from the first was acknowledged to be the greatest of its kind. Its influence on the development of political economy—or economics, as it is called today—has been enormous. In the world of politics, also, it has had a great influence, for Adam Smith was a staunch upholder, on economic grounds, of Free Trade. He died on July 17, 1790.

Smoke AND SMOKE ABATEMENT We all know that fire is an indispensable servant of Man, and that sometimes it is a terrible enemy, but it is little realized that smoke, the product of most fires, is also a very insidious foe, which



FILTHY SMOKE SCREEN POURED OUT BY A MODERN TOWN

The air of a large modern town is polluted by tons of soot particles and other poisonous compounds, which pour continually from thousands of smoking chimneys. Look at the photographs above. On the left you see part of Sheffield in the early morning, while the air is still comparatively clear. On the right is the same scene photographed at midday, when the factories have been belching out their noxious fumes for some time. Is it to be wondered at that infantile mortality from respiratory diseases is abnormally high in such areas? Moreover, to deny sunlight to growing bodies is to endanger their chances of survival.

Courtesy of the British Commercial Gas Association

undermines Man's health, wastes his wealth, and destroys his finest works of art

Smoke consists of a very fine suspension of soot in air. The particles of soot are so small that they float in the air without falling to the ground for a long while (*see* Colloids) and each of these particles can act as a nucleus around which moisture condenses. In large cities such as London and Manchester, where there are millions of coal fires, each belching forth clouds of smoke and acrid fumes, it is not surprising that on cold autumn nights moisture condenses on the particles of soot forming the dirty, unpleasant, "pea soup" fogs.

The other products of a coal fire are water-vapour, carbon dioxide (CO_2), and sulphur dioxide. Both carbon dioxide and sulphur dioxide are very soluble in water, producing carbonic acid and sulphurous acids, so city fogs are really clouds of destructive acid vapours ready to settle all over our buildings, on the trees and parks and also on ourselves. Millions of pounds every year, it is estimated, are spent on repairing the terrible destruction done to London's great buildings by the ravages of those enemies of civilization—smoke and fog.

Wasteful Coal Fires of England

Perhaps you have seen a chimney on fire and wondered why the soot produced by a fire is itself able to burn. Why doesn't the whole of it burn up in the fireplace, and save us all this filth and waste? The answer is that it cannot, because there is not enough air supplied to the grate to make all the coal burn right away. That is partly the fault of our badly designed grates and partly because English people are fascinated by an open fire with its dancing flames and writhing smoke. The idea of "hearth and home" is so strong within us that to remove the familiar hearth seems to be the first step towards the end of home itself.

The wide introduction of gas fires, smokeless fuels, electric heating, air conditioning, and electric trains has helped the scientist enormously in his fight against squalor and filth, but still one great psychological barrier—the lure of the open fire—remains to be conquered. It is true that we pay very heavily for the luxury of a coal fire, for not only does most of the heat go up the chimney, but immensely valuable by-products such as coke and coal tar are utterly wasted, giving us in return acrid, destructive, fog-producing fumes that play havoc with our health and homes. Not until the technique of smoke abatement is highly developed and its methods enforced by law does it seem possible that we shall have beautiful, clean, and healthy cities like Oslo and Stockholm—the pride of Norway and Sweden. Considering the difficulties and loss of life involved in the winning of coal from the earth, it seems

almost criminal to use in so wasteful a fashion the product of such labour.

Smoke, of course, has its uses in the destruction of pests, and as a screen from enemies in times of war (*See also* Fog, Heating and Ventilation).

Smuts, JAN CHRISTIAAN (born 1870) The descendant of a long line of Dutch farmers, Smuts was born at Bovenplaats, Cape Colony, on May 24, 1870. He graduated B.A. at Victoria College, Stellenbosch, and then went to Christ's College, Cambridge where he took a



Topic 11

SMUTS COMES TO ENGLAND

General the Rt. Hon. Jan Smuts, Premier of South Africa from 1919 to 1924, has earned for himself high rank as soldier, statesman and philosopher. The photograph above shows him with his daughter, both in jovial mood, at Croydon airport.

double first in the Law Tripos in 1892. When he returned to South Africa his abilities were recognized by President Kruger, who in 1898 appointed him State Attorney of the South African Republic (the Transvaal). During the Boer War he was engaged in organizing duties until the capture of Pretoria on May 17, 1900, after which he led a Boer force in the field and proved a brilliant leader in the guerilla warfare of 1901-1902. He was one of the Boer representatives at Vereeniging, when peace was discussed and finally concluded largely owing to his influence.

Thereafter he worked with zeal to bring back prosperity to war-ravaged South Africa, and

he was a staunch colleague of Botha, the commander-in-chief of the Boers, with whom he co-operated to found the Het Volk, an organization which brought the union of Boers and Britons appreciably nearer.

His reputation was further enhanced after his visit to England in 1906, when he negotiated with the British Government for self-government of the Transvaal, and the colonies of Natal, the Cape of Good Hope, and the Orange River. Under the name of the Union of South Africa these colonies were now given one government, and upon its formation, in 1910, Smuts was made Minister of Defence, the Interior, and Mines. Two years later, while still holding office as Minister of Defence, he was transferred to the Treasury.

In 1913 Smuts' resolute character was once again thrown into relief when serious unrest occurred among the Rand miners, and while his action in deporting strike leaders caused a furore his influence grew.

Great Services in the World War

The outbreak of the World War in 1914 and the years that immediately followed yielded further proof of his great abilities. When hostilities opened, many Boers sought to free themselves from British control. There was rebellion, but Smuts quickly quelled the rising. Then, in 1915, while Botha was away on active service in German South-West Africa, Smuts not only held the reins of government, but also led an invading column southward until Windhoek, the capital of the German colony, was occupied. After this spell of warfare he

returned to office once more and devoted his energies for a time to the raising of South African contingents which subsequently did such valiant service in France and East Africa. Smuts himself was in command in the latter theatre of war.

Meanwhile the British Government had recognized the genius of Jan Smuts, and in March, 1917, he was summoned to London to join the Imperial War Conference. He was appointed a Privy Councillor and given a seat in the War Cabinet.

After the Armistice in 1918 Smuts played a notable part in world affairs. He was the author of the famous Memorandum on the League of Nations which, in essentials, became the Covenant of the League. He represented South Africa at the Peace Conference, and on the death of Botha in August, 1919, he became Premier of South Africa. In 1924 he became leader of the Opposition, and after a trying period of national unrest he succeeded in forming a coalition government with Hertzog in 1934.

Besides his military and political achievements Smuts enjoyed repute as a philosopher and writer, and his books reveal him as a thinker of great originality.

Smyrna, TURKEY For more than 25 centuries, Smyrna (Turkish Izmir), the most important seaport of Asia Minor, has been one of the chief centres of trade between East and West. There are, however, few remains of Smyrna's early greatness, for it suffered too severely at the hands of numerous conquerors, including Timuri Leng (Tamerlane), who nearly wiped it out early in the 15th century.

Greek colonists settled Smyrna, and it was long a centre of Greek culture and commerce. Since 1923 the government has "exchanged" most of the Greeks for Turks living in Greece. In this city, where one of the earliest Christian churches was founded and where its bishop Polycarp was martyred by the Romans in A.D. 155, are daily heard the calls to prayer from half a hundred mosques. "Allah is great! There is no God but Allah!" For Smyrna has been under the rule of the Turk since the early part of the 15th century, except for a few months after the World War, when it was in the hands of the Greeks.

In 1922 the Turkish Nationalists recaptured the city. A



TURKISH SEAPORT OF SMYRNA

E.N.A.

Smyrna, also known as Izmir, is a great commercial centre, with a magnificent harbour. The town has been largely rebuilt since successive ravages by fire in 1922 and by earthquake in 1928 reduced large parts of it to ashes. Above is a bird's-eye view of the city, looking towards the Gulf of Smyrna.

SMYRNA

few days later a serious fire left most of the buildings in ruins, and caused great loss of life. In 1928, just when reconstruction had got fairly under way, an earthquake laid the new buildings in ruins.

Today Smyrna presents a fascinating mixture of Eastern and Western life. The flags of half the nations of Europe fly above the ships in its busy harbour, and there are fine hotels, theatres, and business houses in the foreign quarter.

Formerly Smyrna was noted for its beautiful rugs, but the use of machine spun yarn and coal-tar dyes has sadly degraded the ancient art. The chief exports are figs, tobacco, raisins, hides, sponges, rugs, silk, and cereals. The population is about 170,000.

Smyth, Dame Ethel Mary (born 1858). The only woman composer to attain some degree of eminence, Ethel Smyth expresses in her work an unusual virility and freedom from convention, though her compositions are more German than English in manner and enjoy a higher reputation abroad than at home. Born in London, April 23, 1858, she studied at Leipzig, where she attracted attention with a string quintet, and by 1893, when her *Mass in D* was sung in London, had established herself as a strong and bold composer. Her operas are "Fantasio," produced at Weimar, 1898; "Der Wald," heard at Covent Garden, 1902, her greatest work, "The Wreckers" (1906), produced in London three years later, and "The Boatswain's Mate" (1917), a popular comic opera based on a story by W. W. Jacobs. Dame Ethel was also a vigorous figure in the feminist movement, composing the suffragette's battle hymn, "The March of the Women." She was created D.B.E. in 1922.

Snails and Slugs. You will naturally think of these creatures as belonging to two great classes—the one with a shell the other without. Those that live in shells have a coiled body which fits into the coils of the shell. Their bodies are provided with strong muscles, by means of which they can draw themselves entirely within the shell when danger threatens, and the part of the body you see outside the shell is called the "foot," though it contains most of the snail's essential organs. Some snails have a horny disk on the foot, which closes the opening



DETAILS OF THE SNAIL

The snail for all its lovely appearance is a highly organized creature. The upper picture shows you its head, with the long feelers which help it to find its way about, beneath it is a very highly magnified portion of the snail's tongue, covered with an enormous number of minute teeth.

J. J. Ward

SNAILS

of the shell when the snail is withdrawn. Other snails seal up the doors of their houses with a slimy substance, which hardens, and in this condition they are able to live through a dry period.

The slugs are really land snails that have no shells or only very tiny scales, on the back. Their bodies are soft, yet muscular and tough, and are straight, not coiled; they can make themselves quite compact and small, or draw themselves out to a considerable length.

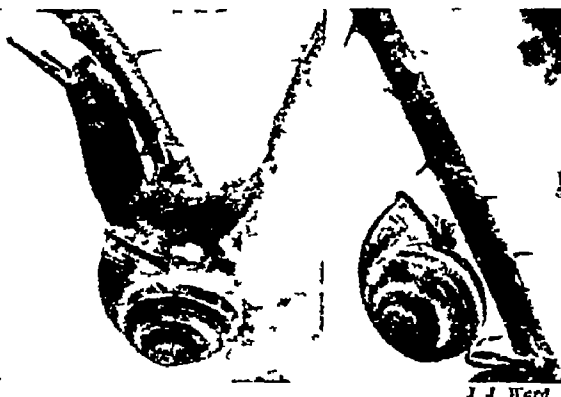
Snails live in salt water, in fresh water, and on land. They feed mostly on plant material, though many are flesh eaters. They cut or shred their food to pieces by means of a peculiar ribbon-like apparatus—the *radula*—in the mouth. The eyes which look like tiny black dots, are situated at the tips of the long feelers, or tentacles, or at the bases of the smaller pair.

Many snails, both water and land forms, breathe air through

simple sac-like lungs. These are called "pulmonate" snails. Forms which breathe in the water have delicate fringes of leaf-like gills.

Snails lay eggs frequently in wonderful capsules. Land snails hatch out in the form of little snails. Water snails begin as very minute creatures, which go swimming freely through the water by means of fine vibrating hairs or *cilia*.

The snails build their houses up, coil by coil, as fast as they need more room, and the largest



SNAIL TACKLES THE PRICKLES

The hedge snail is an adept at journeys among thorns and brambles and in awkward places such as you see here. On the left he is carefully making his way over an especially thorny patch, gliding over the layer of slime which he has laid down, while on the right he rests, suspended by hardened strands of the same slime.

J. J. Ward

SNAILS

coil is the latest, since the shell grows by new material added to its edge. Some of the most beautiful of animal structures are snail shells, especially of the tropics.



GREY AND BLACK SLUGS ON THE MOVE

Here are two of the commonest and most unpleasant slugs of Great Britain. The small one at the top is the grey slug which does so much damage to vegetables of all sorts. The big black fellow below is less common in the garden, for he prefers the damp, luscious meadows by the river. He comes out in the evening, often with thousands of his kind.

Snails crawl upon the "foot", this contains glands that pour out slimy fluid which makes it easy for the snail to glide. That is why the snail leaves a trail behind it when it creeps up the wall.

Several species of the shelled snails can be found commonly in ponds and streams, feeding on the leaves of the water plants. A large European land snail is eaten in France and Italy and is considered a great delicacy. There are, of course, many molluscs closely related to the snails, although they do not bear that name. All the members of the mollusc group *Gastropoda*, in fact, the whelks, winkles, etc., are organized on just the same plan as the snails. (See the article on Molluscs)

Dull creatures you find the snails at first and dismiss them as not worth your interest. But wait! Do you know that snails have quite a highly developed "homing" instinct, by which they find their way back to their hiding-places in the most mysterious way? Do you know that

SNAKES

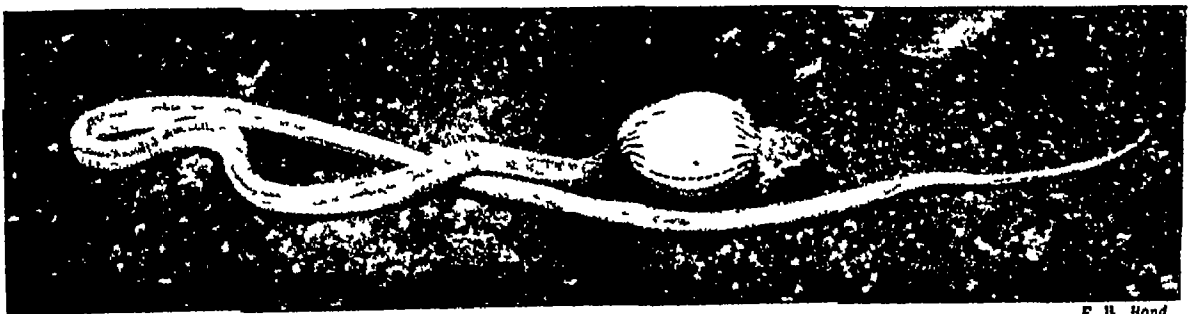
a snail weighing less than half an ounce has been known to drag an object weighing more than a pound over a smooth table? Do you know that if a snail loses one of its "eye-horns," it simply grows another? Do you know that a snail can crawl across the edge of the sharpest razor without cutting itself? And these are only a few of the things that these queer molluscs can do.

Snakes. These reptiles are unpleasant enough in general appearance, without going into details. But here are some strange points about them. For example, they never close their eyes, for they have no eyelids, but only a tough transparent membrane to protect the eyeballs. This gives them that "cold and glassy stare," with which they are popularly supposed to "fascinate" their prey. Then, again, a snake walks with his ribs! Snakes have a great number of ribs, each fastened to a section of the backbone, which is designed to permit the greatest freedom of movement. The tips of each opposed pair of ribs are attached with muscles to one of the crosswise scales of the abdomen. Thus the snake can move each of these scales independently, so that they act as feet, their sharp edges catching on any small roughness in the path.

Nearly all snakes catch and kill their prey, which may consist of insects, fish, frogs, lizards, birds and their eggs, rats, mice, rabbits, and other small mammals. One group lives almost entirely on other snakes.

Many snakes, like the boa constrictor and anaconda of South America, wrap themselves round their victims and crush them, while others kill by their poisonous bite. The "constrictors" are the larger, though also the less dangerous to man.

The poisonous snakes usually rely on their venom to put an end to the struggles of their prey. The others simply swallow their catch without attempting to kill it first—in either case,



THE EGG-EATING SNAKE, SWOLLEN WITH HIS AMAZING MEAL

What a job it must have been for this egg-eating snake, you may well think, to have gulped down so large an egg! Yet he probably found it quite easy, for his jaws can be readily dislocated and, once the egg is swallowed, it is crushed into small fragments by the snake's throat muscles. All the same, you cannot but admire the skin which stretches so easily to such an enormously enlarged diameter, for, as snakes go, this egg-eating sort is by no means a large one.

SNAKES

it disappears, whole, inside the snake. For another of the important peculiarities of a snake's structure consists in the very elastic connexion between the two halves of the lower jaw, and the generally loose attachment of all the bones around the mouth and throat, so that when it eats a snake can dislocate its own jaw

and the "krait," the two most dangerous kinds these are the snakes which are responsible every year for many deaths in India (See Cobra) The remaining species belong to the great viper family, which includes the true vipers (*Viperinae*) and the pit vipers (*Crotalinae*) To the latter family belong the rattlesnakes, the moccasins, the deadly "fer-de-lance," etc (See Viper)

Cobra poison, which is considered the most deadly of all, creates at first a burning pain in the wound. One of its characteristic effects is to make the victim speechless after a few minutes. Rattle snake poison, while less deadly, is more violent in its action upon the system.

In addition to the highly poisonous snakes mentioned, there are many species of "semi poisonous" snakes. These are unable to do much harm to large creatures.

This still leaves a vast majority of perfectly harmless species of snakes. In many parts of the world certain of these snakes are regularly employed as pets for catching mice and rats.

When the world was young snakes were worshipped as gods or friends of the gods, and were symbols of wealth and knowledge. Serpents were also kept in the sanctuaries of Aesculapius, the Greek god of medicine.

In the Middle Ages snakes became associated with black magic and evil spirits, and countless



WHIP SNAKE AT HOME IN THE BUSHES

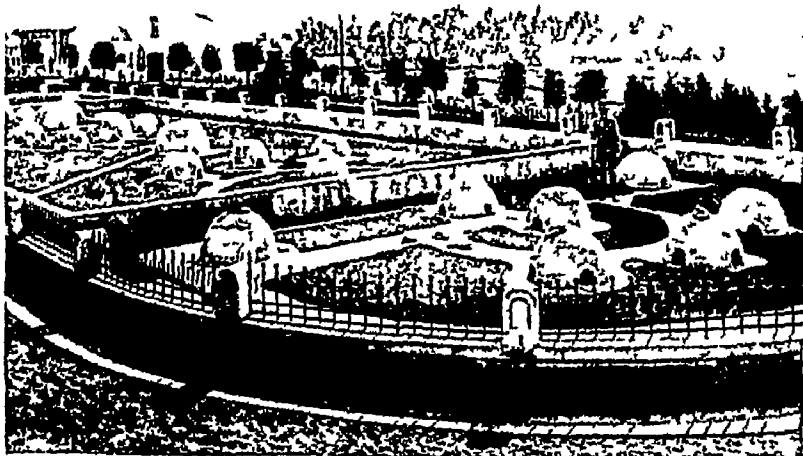
This little snake is a terror to birds, lizards and other small creatures, for it lurks among the bushes its thin body making it look like a branch. Safely anchored by a couple of turns of its tail it strikes with lightning rapidity at anything that comes within reach. On the ground however it reveals itself as an awkward creature

without the least trouble. Thus, the egg-eating snake of South Africa, which is about 2 feet long, and not much thicker than a man's finger, can perform the amazing feat of swallowing a hen's egg without breaking the shell. When the egg, however, has passed a few inches down the neck it strikes spiny projections from the backbone, the shell is broken, and the fragments are got rid of

There are about 1,600 species of snakes. They dwell in dense tropical forests, in deserts, on high mountain tops. Some burrow in the ground, some live entirely on the surface, some spend most of their time in trees, others frequent swamps or fresh waters, or dwell in the sea.

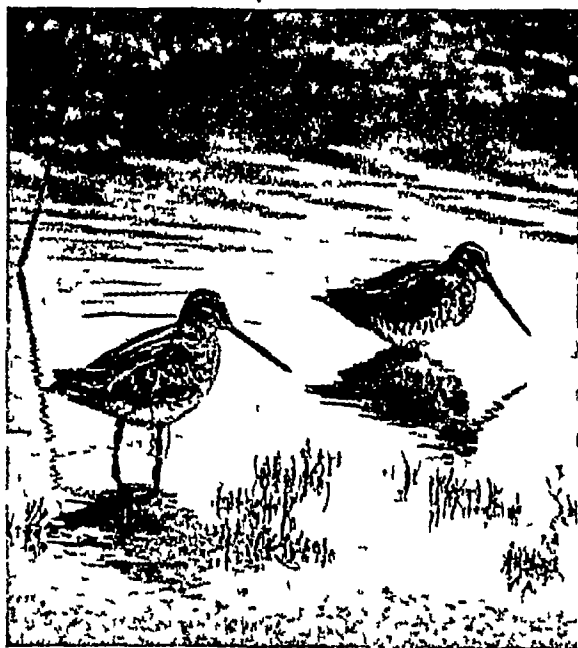
The sea snakes, found mostly in the tropical waters bordering Asia and Africa, usually have the body flattened at the sides, which makes them powerful swimmers, but awkward on land. They are all poisonous. Do not confuse them with so-called "sea serpents" (qv).

The highly poisonous land snakes mostly belong to two families typified by the cobra



WHERE SNAKES ARE BRED FOR THEIR POISON

In this curious snake farm, situated at Butantan in Brazil, all sorts of venomous snakes are bred for their poison. This is extracted from them and used in the preparations of antidotes employed for the cure of snake bite. The snakes are kept in the little domed houses until wanted for their venom.



TWO SNIPE ON THE FEED

As members of the great order of waders, snipe are more or less water-birds. Their long legs and long, sensitive bills are especially adapted to enable them to feed in such places as this without getting wet. Here, too, you can see plainly their striped plumage.

myths centre about monstrous serpents guarding treasures in caves or dwelling in the depths of the sea. The majority of people, even in civilized lands, continue to look upon snakes with unreasoning fear, for the feeling persists towards snakes that are known to be harmless.

Snakes are silent, secretive creatures. They appear and disappear with soundless mystery. When cornered and excited they have no voice, except a long sinister hiss. Wild animals in general appeal to us by their cries, like a half-understood language, but snakes can make no such appeal.

The majority of snakes lay eggs, which are whitish with a tough outer shell, but most of the vipers and all the sea-snakes bring forth

living young. As soon as the young are born or hatched, they are able to shift for themselves the poisonous varieties having fully developed fangs and venom sacs. In cold countries snakes remain in a torpid state during the winter.

Snakes form the sub-order *Ophidia* of the order *Squamata* of the Reptile class. They are usually grouped with the lizards. (See also the article on Reptiles.)

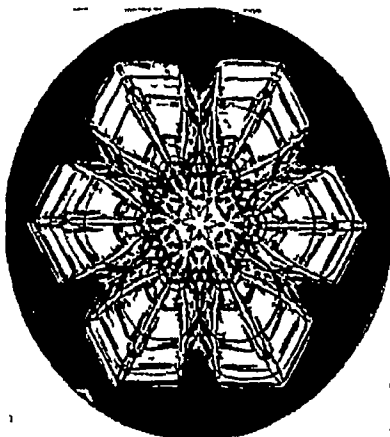
Snipe. In marshy or moorland country you may sometimes surprise a small, brownish bird, some ten inches long including its long bill, which after a single cry of alarm makes off with extremely rapid, zigzag flight. This is a snipe (*Capella gallinago*), one of our commonest marsh birds, and a representative of the great group of waders. (See Waders.)

It nests in the marshes, laying four pear-shaped eggs in a round depression in the grass or heather, and it is much sought after by sportsmen, because it is so very difficult to shoot.

Other British species of snipe are the great snipe, a larger bird than the common species, which it otherwise resembles, and the jack snipe, only seven inches in length. Both of these are winter visitors, and neither is common.

Snow. In all latitudes snow forms out of the moisture in the upper air, but melts as it falls through the lower air, if this is warm. Thus from the Equator to latitude 30° snow is almost unknown at sea-level, from latitude 30° to about 40° it is an occasional winter visitant, from about 40° to 75° it is generally present during a longer or shorter period in winter, in latitudes above 75° snowfalls are perennial, wherever there is land.

At the Equator the snow-line—the height at and above which snow does not melt—is about 17,000 feet above sea-level. From the Equator it descends to about 13,500 feet in latitude 30° and 1,000 feet in latitude 70°. In regions of perpetual snow the weight of one



WONDERFUL PATTERNS FORMED BY SNOW CRYSTALS

When you see the soft snowflakes falling, it hardly seems possible that they can really be composed of innumerable minute crystals such as those shown in these three pictures. Yet it is so, for snow is really a form of frozen water, usually taking up this beautiful hexagonal form, with six-rayed crystals. For all their regularity of form, however, snow crystals vary enormously and no two are ever quite the same. These pictures of course are very highly magnified.

SNOW

snowfall on another may, on steep mountain slopes, produce a snow slide or avalanche (*q v*), on less steep slopes, the lower part of a snow field is changed to glacial ice, (*See Glacier*) Even in Britain snow drifts may prove impassable or even dangerous In country districts the snow-plough is sometimes used to clear the obstructed roads and railways

A very curious phenomenon is sometimes seen in low latitudes, where the tropical sun shines on the mountain snows In parts of South America, for instance, the relentless rays of the sun sculpture the perennial snow into fantastic colonnades so closely resembling rows of kneeling human figures that they are called the "snow of the penitents"

Where winters are severe the presence of the snow blanket throughout the winter protects the sleeping vegetation beneath from cold that would be fatal to it When the spring comes the melting snow is equally useful in supplying moisture at exactly the right time for the awakening seeds and bulbs

Snow consists of water crystals, though some times the snowflake is a shapeless woolly tuft or pellet composed of debris of the typical six-sided crystals Probably no other substance crystallizes in such an infinite variety of beautiful forms as water Some crystals are flat or tabular, some are columnar needles, and some are compound structures, and the variations of these three classes are endless The most numerous and beautiful are the flat crystals, some of which branch out into flowered rosettes, while others within the plain six sided outline contain beautiful inlaid designs formed by tiny air tubes within the crystal structure The most curious are perhaps the "cuff-link" doublets composed of a large and a small tabular crystal connected by a columnar needle Crystals formed in the low clouds are usually large and branching, those from the high clouds are small and compact

Not every snowstorm furnishes good specimens of snow crystals The western, south-western, and north-western segments of great storms usually furnish the most perfect and beautiful crystals You can imagine how difficult it is to photograph snowflakes before they melt, yet

the first man to accomplish the feat has photographed more than 1,000 different forms

Red, green, blue, and even black snow is occasionally seen in many parts of the world The colours are due to the presence of innumerable tiny fungi, or to dust collected by the snow as it falls through the air

Snowden, PHILIP, 1st VISC SNOWDEN OF IOKORNSHAW (1864-1937) Lying on a sick bed as the result of a cycling accident, this son of a Yorkshire weaver spent part of his time reading a criticism of Socialism The invalid picked out the weak points of the book, and was converted to the cause which it sought to discredit Philip Snowden was then a clerk in the Civil Service, given to puzzling out things for himself, and not at all in love with routine work Almost crippled, he gave up his appoint-

ment and determined to devote himself to journalism and politics

He joined the Independent Labour Party, thought, spoke, and wrote on his newly-found faith, and became a Member of Parliament on his third attempt in 1906 During the World War he was a strong pacifist and supporter of a peace by negotiation As a result he lost his seat in 1918, but returned to the House of Commons in 1922, and in the Labour Governments of 1924 and 1929-1931 held the post of Chancellor of the Exchequer He was a leading founder of the National Government of



SNOWDROPS IN THE SNOW

These lovely little plants often come up so early that they have to force their way through snow before they can flower Their delicate blooms seem none the worse for the bitter weather, although in this cold they do not expand widely

1931, and served for a time as Lord Privy Seal Created a viscount in 1931, he died suddenly on May 14, 1937 (*See illustration in page 2417*)

Snowdrop. One of the earliest of all spring flowers, the snowdrop (*Galanthus nivalis*) is certainly the first to attract our attention, and it often appears in masses, its white blooms carpeting the ground Indeed, the first snowdrops really may have to push their way through the snows of winter, although their name refers to their appearance, not their early flowering The flower has three sepals and three petals, each of the latter bearing a green marking which relieves the bloom's pure whiteness The leaves are a delicate greyish green, long and slender like those of all members of its group, the order *Amaryllidaceae* Another member of the same group is the snowflake (*Leucojum aestivum*) which, however, blooms in summer

Snow White and the Seven Dwarfs

ONE of the most popular of the world's fairy tales is the Grimms' "Snow White and the Seven Dwarfs," which has been brought to life on the cinema screen by Walt Disney. Briefly told, it is as follows:

"Skin as white as snow, lips as red as blood, hair as black as ebony"—these were the gifts wished for the little princess, Snow White, before she was born. Her mother died when Snow White was very young, and her stepmother, the new Queen, was a jealous, cruel woman. She had a magic mirror which answered truthfully every question she asked it, for years it had told her that she was "the fairest in all the land." But one day the mirror said that Snow White was now the fairest, for so she had been called by the young Prince with whom she had fallen in love.

So the wicked Queen sent Snow White into the woods with a huntsman, who had orders to kill her. But the huntsman could not bring himself to do so cruel a deed, and warned Snow White to run away. She fled through the woods, terrified, until she was very, very tired. As she lay sobbing on the ground, all the little animals of the forest came round her and comforted her. She told them all about her troubles, and the animals and birds led her to a tiny house among the trees. Snow White went in, and



Illustrations from the Walt Disney colour film of 'Snow White'

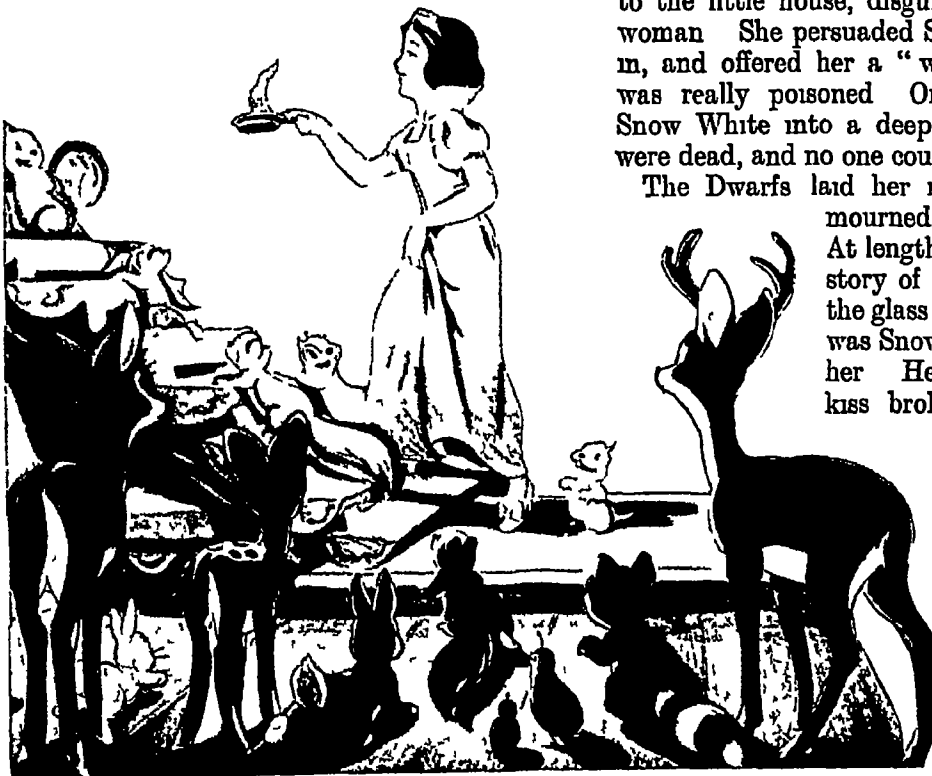
found a very untidy room with seven little chairs, while upstairs she and the animals found seven small beds. Snow White lay down on three of them and went to sleep.

This little house belonged to the Seven Dwarfs, and when they came home from their day's work in the mine under the mountain they were very much astonished to find Snow White asleep on their beds. But she woke up and told them her story, and they decided she could stay and keep house for them. When they went off to work in the morning they warned her to be very careful and let no one in, for they knew how cunning the Queen was. And, indeed, the Queen had learned from her mirror where Snow White was, and she came to the little house, disguised as an old pedlar woman. She persuaded Snow White to let her in, and offered her a "wishing apple" which was really poisoned. One bite of this sent Snow White into a deep sleep as though she were dead, and no one could wake her.

The Dwarfs laid her in a glass coffin and mourned over her sorrowfully.

At length the Prince heard the story of the lovely maiden in the glass coffin, and, guessing it was Snow White, came to see her. He kissed her, and his kiss broke the evil spell of

the apple so that she awoke, amid the great rejoicing of the Dwarfs and her animal friends. Then the Prince took her away to his castle and made her his wife, and they lived happily ever after.



The HISTORY of a CAKE of SOAP

What do you know about the slippery oval that you rub between your hands over the sink or bathroom basin? This article tells you many things concerning this essential of civilized existence

Soap. "Cleanliness is next to godliness," we are often told, and true cleanliness would be next to impossible were it not for soap.



This humble article of everyday use was never so appreciated as during the World War, when the supply of raw materials was depleted and soap became difficult to obtain. In some of the war-wasted countries fabulous prices were paid for a cake of it, and in many places it could not be obtained at any price.

Indispensable as soap is to us, it was abso-

lutely unknown until about the beginning of the Christian era. In early times people anointed their bodies with olive oil, and used juices and ashes of various plants and fuller's earth for cleansing purposes. The Roman writer Pliny, in the 1st century A.D., refers to two kinds of soap—hard and soft, and mentions it as a Gallic invention "for giving a bright hue to the hair." In the ruins of the buried city of Pompeii a complete soap making establishment was found and some well-preserved cakes of the finished product, resembling closely the soap of today.

Soaps are Salts

Soap, to most of us, means a cleansing substance which makes a lather in soft water. A chemist, however, will tell you that soaps are metallic salts of certain fatty acids. Some of these salts—those of sodium, potassium, and ammonium—are cleansing agents soluble in water, others, such as the lead soap used in pharmacy as a plaster base, are insoluble and useless as cleansers. Potassium soap is soft soap. Hard soap is a sodium compound.

Soap is made by the action of alkali on fats or oils. A simple experiment will show you how alkali acts on grease. Put a spoonful of washing soda with a little water in a greasy frying pan and boil the mixture. In a few minutes the soda and grease will have combined to form a thick soap, which can be washed out, leaving the frying pan clean. The discovery of the Leblanc soda process about 1791 (see Acids and Alkalis, Sodium) gave a very great impetus to the soap making industry of the early 19th century. It became organized on a scientific basis, however, only after the re-

searches of the French chemist Chevreul, published in 1823, showed the composition of animal fats (fatty acids in combination with glycerine), and the character of the reactions in saponification (the substitution of the metal in the alkali for the glycerine in the fat). This is the essence of all soap products. (See Fats)

Either vegetable or animal fat may be used in soap making, and of the latter the fat from cattle and sheep takes first place. The list of vegetable fats that may be used includes coconut, palm, cotton-seed, and soya oil. As an excess of fat in the soap would result in too greasy a mass, and an excess of alkali would burn the skin and rot the clothing, the correct balance must be obtained.

In big soap factories the soap is made in large pans, some having a capacity of 175 tons,

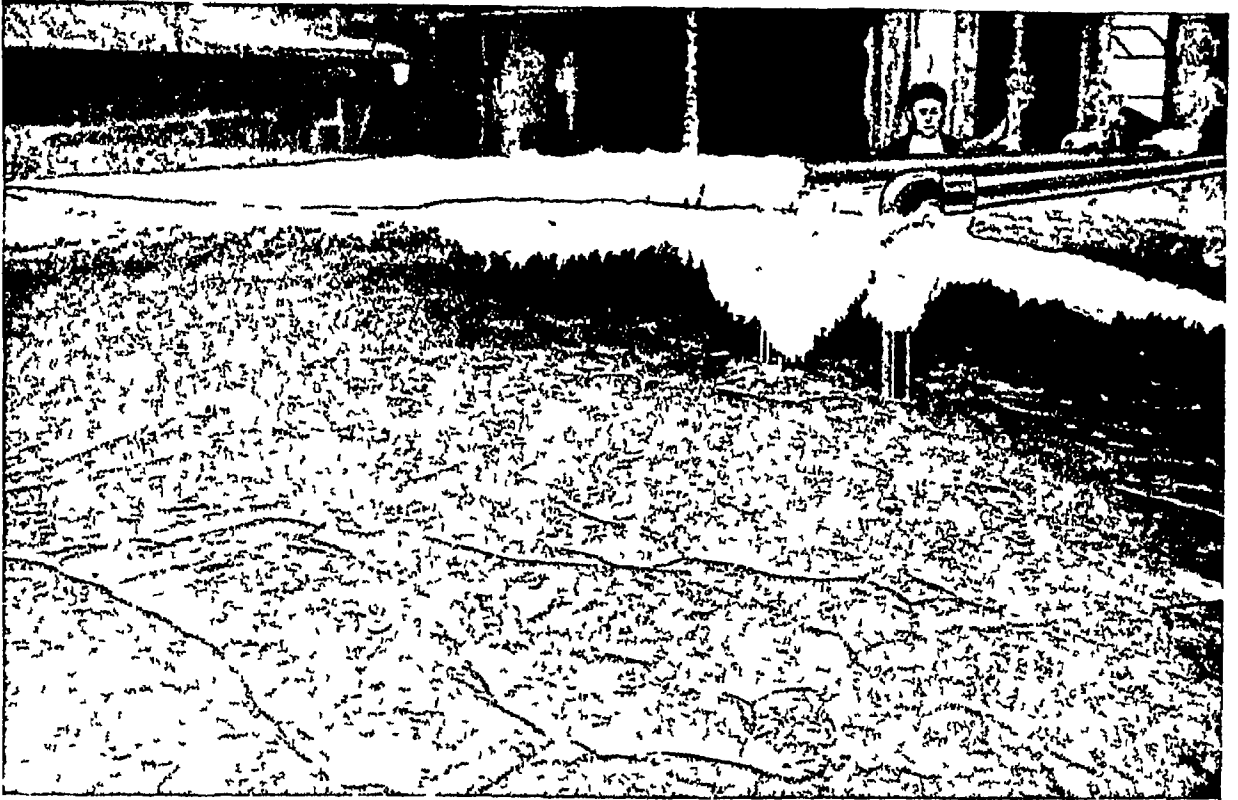


SOAP MAKING IN ROMAN GAUL

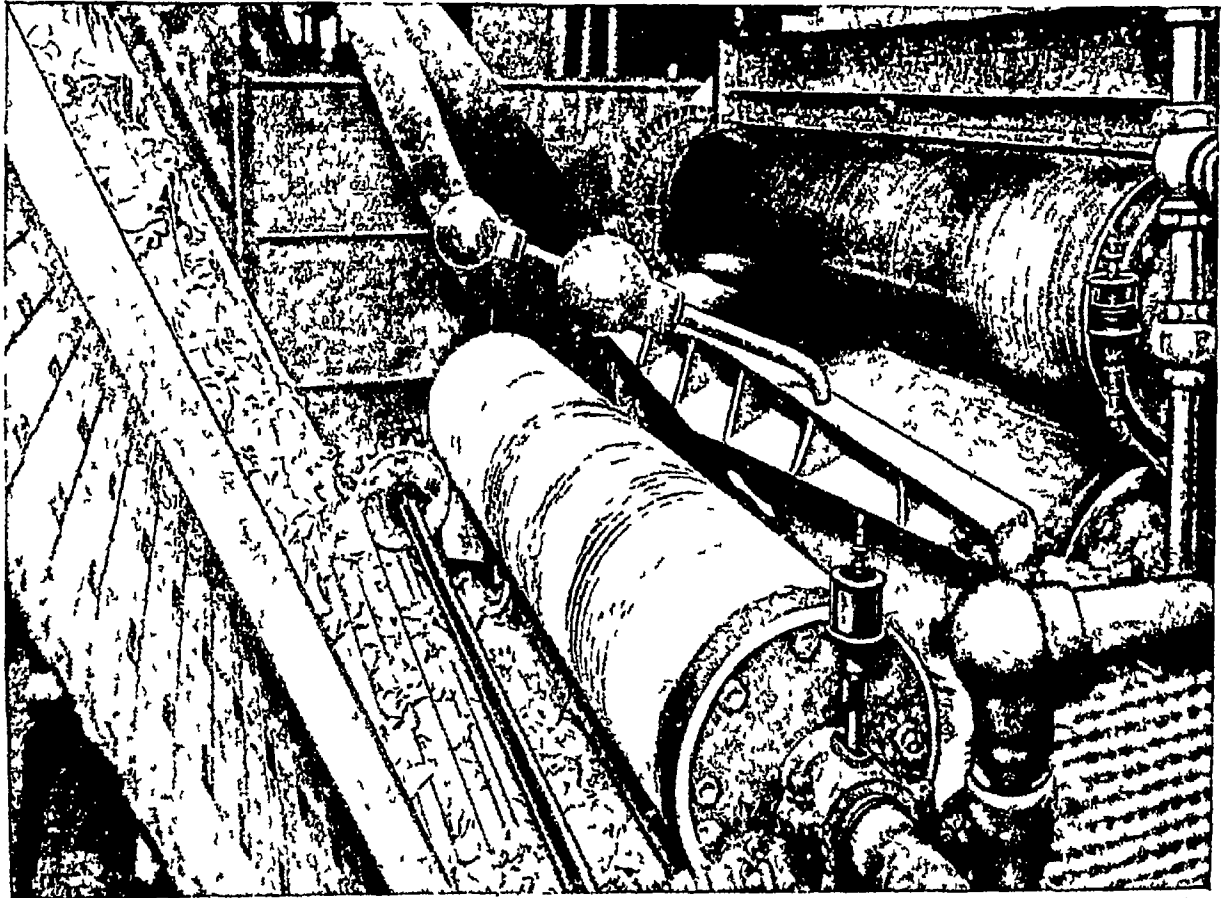
This ancient relief from Epinal shows a combination of pharmacy and soap factory in Roman Gaul—Gallic soap was largely used as a hair dye—with a woman stirring the contents of a basin over a stove and an assistant attending to another tub.

Les Archives Photographiques d'Art et d'Histoire

HOW SOAP IS MADE — BOILING AND DRYING

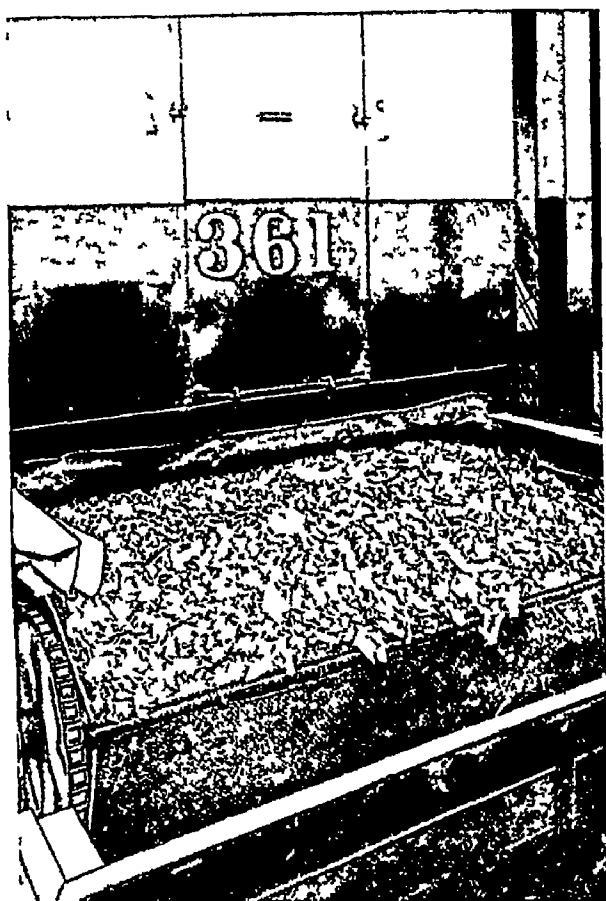


Here is the gigantic soap kettle in which the ingredients are boiled in a modern soap factory. And huge as it looks, you do not get a true idea of its real size, for this kettle is four storeys deep and holds 275,000 pounds. It is heated by steam coils, and the ingredients are boiled for 11 days, until they are thoroughly blended and ready to be worked into soap.

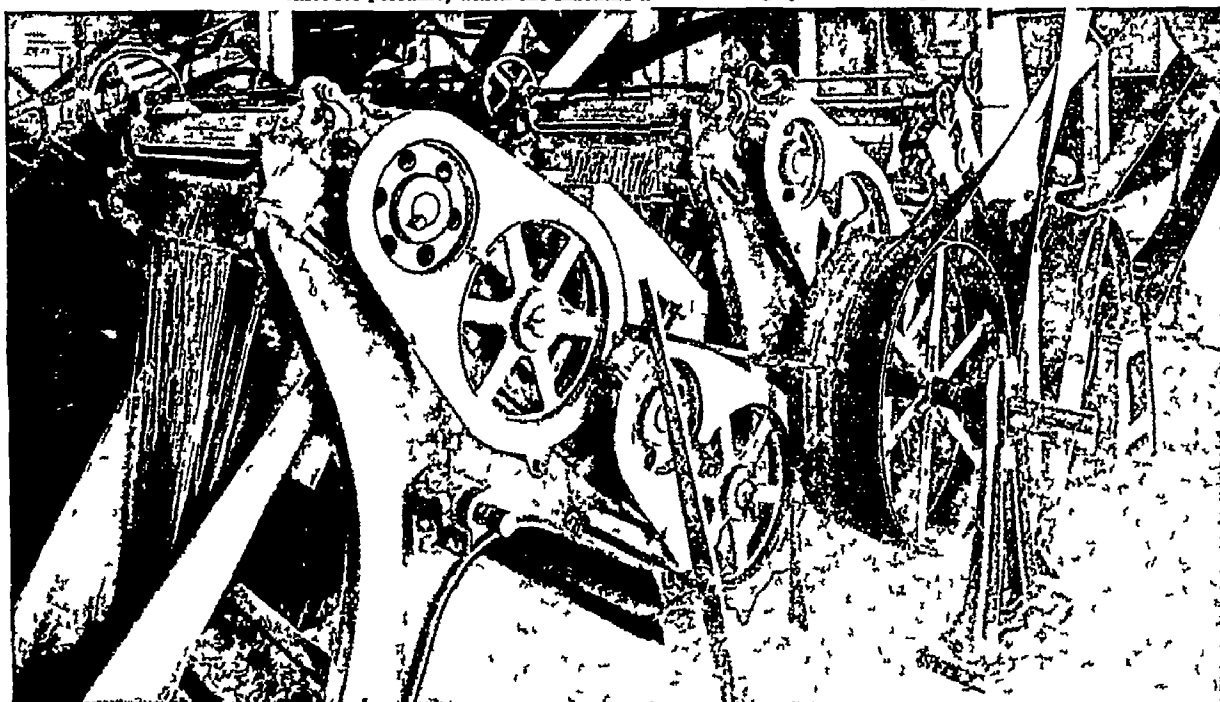


After boiling in the kettles, the soap is allowed to cool somewhat and then is run through the rollers at the right. They are of granite and are chilled with water. They congeal the liquid soap and deliver it to the heated roller in the middle of the picture. This roller irons out the soap into chips and delivers the chips to the endless belt at the left, which carries the chips into the drier.

PUTTING THE PERFUME INTO SOAP CHIPS



The picture at the left shows the chips being discharged after a 25-minute journey on an endless belt through the drier at a temperature of 160°. The trip has given them just the right degree of hardness for the processes to come. In the picture at the right, the measuring scale (numbered 231) is delivering measured quantities of dried chips to the mixer (numbered 213). The mixer has an inlet for perfume, which the machine mixes thoroughly with the soap.



These machines are the "mills," where the scented soap is worked over and over by granite rollers, and finally is delivered as the ribbon-like strands you see at the left. This "milling" process is the secret of good soap, for upon it depends the smoothness of the finished article. Inspectors test each lot for smoothness and uniformity of mixture, and send back for further treatment any portion that does not come up to standard.

equivalent to 10 or 12 truck-loads of the finished product. These pans are made of steel plates riveted together, with a cone-shaped bottom. They are heated by steam coils, and have inlet pipes for water, alkali and other materials.

First the fats are run into the pans. An alkali is added and "saponification" takes place, that is, the fats break up into their component parts—fatty acid and glycerine—and the fatty acids combine with the alkali, making soap. The glycerine settles to the bottom when a saturated salt solution is added. In making ordinary yellow laundry and kitchen soaps, this glycerine, which is a valuable by-product, is drawn off from the bottom and carefully preserved. The glycerine is not removed from some soaps, others are made from free fatty acids so that no glycerine is produced.

Two Weeks on the Boil

The soap is boiled a number of times in order to purify it, and is then left to cool. This process, in large vats, takes about two weeks. It is then run into a "crutcher," and the mass is beaten smooth by paddle blades revolving on a central shaft. Perfume and colouring matter are added to the product at this point, if desired. Resin is added to laundry soaps in the boiling, giving them their yellow colour.

The soap now goes into the frames, or moulds, in the drying-room. When it is hardened the sides of the frame are stripped off and the blocks of soap removed. They then go into the cutting machines to be divided into bars, and the bars are dried, pressed into cakes, and wrapped at the rate of 60,000 cakes per day.

The boiling process is the same for toilet and laundry soaps, except that the fats for the latter are of poorer quality. The toilet soaps do not go to the crutcher but are sent directly to the drying-room. Then they go to the mixer or "mill" where perfumes and colouring matter are added. The mill consists of a number of revolving stone rollers set closely together in an iron frame, this condenses the soap. The soap leaves the mill in the shape of thin ribbons, and is then pressed into a compact mass and cut into cakes.

Special Kinds of Soap

Transparent soaps are prepared in two ways, either by dissolving ordinary soap in alcohol or by a "cold process," which leaves the glycerine in the soap. In the first case the alcohol solution is decanted and the alcohol distilled off, the residue is a thick transparent jelly which, when cast into forms and allowed to dry, comes out as a transparent mass. Glycerine soap consists of glycerine and soap in about equal parts. An excess of glycerine makes liquid soap. In some soaps fine sharp sand or powdered pumice are incorporated, and the result is a scouring soap. Soap powders

are powdered mixtures of soaps, soda ash, and sodium carbonate. The so-called "floating" soaps are usually made by forcing air into the hot soap. Medicated soaps contain substances which exercise a specific influence on the skin. Castile soap is a hard white soap with olive oil as its fatty base. It approaches the nearest to a perfect soap—without smell or colour.

How Soap Gets Out the Dirt

Now what happens when we wash our hands or clothing with soap? You know that our sweat glands are constantly giving off a certain amount of oil, which catches dust and dirt and soils our clothing. When soap is dissolved in water and rubbed on the hands or on soiled linen, it acts in two ways. First, it forms an *emulsion* with the oil, that is, the metallic part of the soap molecule dissolves in the water whilst the fatty acid end of the molecule attaches itself to the oil. So the oil is washed out with the soap. Second, the very fine particles of soot and dust attach themselves to the tiny droplets of the soap solution, so they too can be washed out.

Soap Bubbles. What would you say of a man who, although blind and dependent on the eyes and hands of others, took up the study of soap bubbles, and left a scientific reputation largely based on his truly remarkable work with them? That is what Joseph A. F. Plateau, a Belgian physicist (1801–1883), was able to do.

He learned by the study of the soap film a great many interesting and important facts about the internal forces in liquids. And so he proved that there really is much to learn from bubbles, as Sir Isaac Newton had also done two centuries before. (See Newton.)

For instance, why is a bubble round? For the same reason that a raindrop is round—because a liquid surface (by virtue of a property known as "surface tension," closely related to capillarity) tends to become as small as conditions will permit, and a sphere has a smaller surface than any other solid of equal volume. This is why drops of dew are round, and why melted lead poured from a shot tower falls in spherical drops.

A bubble has two surfaces—one inside, one outside—while a drop of water has only one. The surface tension in a bubble is, therefore, twice as great as that in a drop of water of the same size, and so the bubble contracts until the pressure of the air within stops it. Moreover, gravity, pulling the liquid from the top of the bubble, makes the upper walls ever thinner and more fragile, so that the life of a bubble is brief.

A soap bubble lives longer than a bubble of pure water, because soapy water has less contracting power—a weaker surface tension—than pure water, and also because of a remarkable property by which the surface tension varies and

the bubble mends itself, so to speak, from instant to instant Soap bubbles of special soap solutions with glycerine have been kept for days under favourable conditions One is recorded to have lived nearly a year

What causes the beautiful play of colours in a soap bubble? Light falling on a soap bubble is reflected from both surfaces of the film The waves of the reflected rays will be out of step, thus annihilating each other (See Light) Where this interference banishes one of the colours, you see its complementary colour in the light that still remains (See Colour) As the bubble varies in thickness, so will the colours of light it reflects

Why does a bubble rise when you first blow it, and sink later, if it does not break first? Your breath which blew it is warm, and warm air is lighter than cold You can float a cold bubble, though, on the surface of a gas heavier than air, such as carbon dioxide or ether, and it floats until the heavy gas gains admission to the bubble These are only a few of the interesting things that scientists have learned from the study of soap bubbles

Social Credit.

Why is it that in an age of machinery and fertilizers, when goods of one kind and another are produced in greater quantities and far more cheaply than ever before—why is it that there should be in nearly every country great numbers of unemployed? Why is it that millions of people go without not only luxuries but the necessities of life, while at the same time there are millions of workless who are tramping the streets or lining up in the queues at the Labour Exchanges? Why, in brief, is there "Poverty in the midst of Plenty"?

Many reasons are advanced by the professional economists, but none is really convincing Small wonder, then, that of late years there have come into prominence a number of "amateur" economists who maintain that the explanation of the paradox lies in the fact that there is not created sufficient money (or, in other words, purchasing power) to go round

According to these "Social Credit" theorists—of whom Major C H Douglas, an engineer by profession, is the best known—the flow of money into people's pockets is too slow to enable them to buy the goods and services that are on sale at any particular moment The money paid out in wages, salaries, etc., is not sufficient (so they argue) to purchase the buildings, food, clothing, amusements, etc., that the people's labour brings into being—nor would it do so even if all wages, etc., were doubled or trebled

Hence Major Douglas advocates the periodical distribution of a National Dividend—"money for nothing"—which would be increased if the national production had increased, or decreased if it had gone down Everybody—old folk and babies in arms, rich and poor, workers and lazybones—would receive the same dividend, and so for the first time in history men would be liberated from the tyranny of work This dividend would be "backed" by the credit of the nation as a whole—hence the name Social Credit

Social Credit was the platform of a political party which came into power in the Canadian province of Alberta in 1935, but the schemes which were



BUSILY BLOWING BUBBLES

A clay pipe and a bowl of soapy water are not expensive toys but few games are more enthralling to kiddies than blowing bubbles What fun they get out of watching the bright-hued bubbles go sailing away into the blue! This little girl, as you see, is no different from all other children of her age

introduced were disapproved of for the most part by Major Douglas

Another monetary theorist is Professor Soddy, the distinguished physicist of Oxford University He does not believe, however, in a National Dividend but in the issue by the State—and only by the State, and not by private banks—of sufficient credit to keep prices stable

Mention may be made also of Silvio Gesell, who as long ago as 1891 published his views on monetary reform He thinks that what is wrong with money is that it doesn't wear out, whereas what it purchases sooner or later is done with Hence he suggested a way by which money could be made to decay just like goods, every pound note should lose its value unless it is stamped each month with a sixpenny stamp Under this system it certainly wouldn't pay to be a miser!

The books about Social Credit and its allied theories are often contradictory, but in all countries there is an increasing number of people who suspect that insufficient money is the prime cause of our economic distress

Socialism. The Industrial Revolution was still young when the first protests at its uncontrolled course began to be heard, and there arose men who asked if the bad results—the poverty and squalor, the overcrowded and horribly insanitary towns—were really included in the price that must be paid if men were to take advantage of the vastly increased powers of production and means of transport that had so strangely and suddenly been put at their disposal

These first Socialists are called the "Utopian Socialists." Their plan was to reconstruct society, and establish a system by which the profits produced by labour should be divided among the workmen. Robert Owen (1771–1858), the first and perhaps the most famous of the Utopians, was a wealthy manufacturer, who made his own factory town, New Lanark in Scotland, a model community. Owen wished to establish such communities all over the world. Each was to contain about 1,200 people, who were to live in one large building and share the profits from their labour on farm and in factory. Several communities modelled on his ideas were set up, but failed. The chief outcome of the movement was the forming of co-operative and profit sharing industries and stores, which have been successfully introduced into many parts of the world. (See Co-operative Societies) In France the chief "Utopians" were Count Saint-Simon (1760–1825) and F. M. C. Fourier (1772–1837)

What is Socialism?

Despite Owen's enthusiastic advocacy, Socialism—a term which may be, and has been, defined in hundreds of ways, but which may be regarded, generally speaking, as the substitution of community-ownership for individual ownership of the means of economic production, distribution, and exchange—made but little headway in Britain, although the enfranchisement of the middle class and the publicity given to the more horrible social scandals led to much reformatory work by way of legislation

Louis Blanc (1811–1882), a Frenchman, who was at the height of his fame in 1848–1849, represented this second type of Socialism, sometimes called "political" or "government-ownership Socialism." Its chief outcome was the gradual adoption in many lands of State ownership of railways, telegraphs, telephones, and other "public utilities."

Karl Marx, a German Jew, was the founder of modern "scientific socialism" as opposed to the Utopian, sentimental, or voluntary variety

preached by Owen and the French theorists. The first exposition of the new gospel was contained in the "Communist Manifesto" (to Marx, it should be remembered, Communism and Socialism meant practically the same thing) issued by Marx and his life-long friend and supporter, Friedrich Engels, in 1847. The Manifesto contains a searching analysis of economic evolution and description of the great part played in that evolution by the middle class, the bourgeoisie. It concludes with words which have found an echo in many a rebellious worker's heart: "Let the ruling classes tremble at a Communist revolution. The proletarians have nothing to lose but their chains. They have a world to win. Working men of all countries, unite!" Twenty years later appeared the first volume of Marx's "Das Kapital," well described as the Socialist's Bible.

Teaching of Karl Marx

Marx (*q v*) declared what would inevitably come to pass—the concentration of capital into fewer and fewer hands, the incessant war of classes, the final conflict between a handful of "capitalists" on the one hand and the millions of class-conscious, propertyless "proletarians" on the other, the ensuing "Dictatorship of the Proletariat," to endure until all classes have been abolished, and a society of free and equal citizens has been created.

Socialism by piecemeal, by peaceful permeation, or what Sidney Webb (Lord Passfield), one of their leaders, styled the "inevitability of gradualness," was the method of the Socialists who in 1884 founded the Fabian Society, and the Statute-book of the next fifty years shows how successful a method this has been. In 1893 the Independent Labour Party was founded by J. Keir Hardie, J. Ramsay MacDonald, and others, and in 1900 the Labour Party (*q v*) came into being. This is now a definitely Socialist party and aims at the reconstitution of society on the basis of "service instead of profit."

The Russian Revolution of 1917 and its aftermath saw the wholesale introduction at the hands of Lenin and Stalin of many of the principles of Communism, which may be regarded as an extreme form of Socialism. (See Communism) The National Socialists (Nazis) of Germany are far more nationalistic than socialistic. They are, in fact, really Fascist in outlook, and as such radically opposed to the international and equalitarian doctrines of Socialism or Communism. This opposition is one of the main causes of conflict in Europe today.

Some of the great names on Socialism's roll of fame have been mentioned above. Yet it must be remembered that it was not these who were the real missionaries of the Socialist gospel, but the humble workers who spent their days at the bench, in factory or mine or dock, and



Other University settlements followed, notably Oxford House at Bethnal Green and Cambridge House at Camberwell, and many of the great public schools run clubs for poor boys in London and elsewhere. Another class of settlements is principally religious in aim, e.g., the Robert Browning settlement (named after the poet), which is situated in Walworth, London, and the Woodbrooke Settlement in Birmingham.

their evenings mounted on soap box platforms at wind swept street-corners, in crowd-filled parks. Throughout the industrialized world they were to be found, loud-voiced and argumentative, passionately convinced of the utter rightness of their cause, of the inherent vileness of the "bloated capitalist" and the rottenness of "capitalist" society (See also Capitalism, Labour Movement).

Social Settlements.

In the poorest and most thickly-populated quarters of some of our great cities may be found "settlements," societies of

social workers, drawn for the most part from the well-to-do and University educated classes of the community, who spend their lives amongst their less fortunate fellows in the hope of promoting their welfare—material, cultural, and, in some cases, religious.

The movement may be said to have begun with the establishment of Toynbee Hall in Whitechapel in 1884, this was named after Arnold Toynbee (1852-1883), a brilliant young university don who had striven hard to raise the educational level of the working classes.



CARRYING OUT THE 'SETTLEMENT' IDEA

Much is being done in Britain to help the less fortunate classes of the community. The top photograph shows an orchestra of unemployed men at Ealing—an example of the social service which, though not directed by a "settlement," has much the same aim. Below is seen an art class at Toynbee Hall, the famous social settlement in Whitechapel, London.

Photos top G.P.A. bottom Weekly Illustrated

The workers who live in the settlement visit those about them in a friendly, neighbourly way, and comfort them with sympathy and advice. In the evening men, women, and children of the neighbourhood gather in the reading and recreation rooms and amuse themselves with games and in other ways.

Evening and day classes of many kinds, including music, dressmaking, gardening, etc., are organized for those who wish to attend them. There are also clubs of various sorts—gymnastic, athletic, debating, reading, dramatic,

political, and so on—as well as many lecture courses and musical entertainments. So far as possible the clubs are managed by the members.

An enormous impetus to a really well-organized social service—in which social settlements must play a great part—came with the establishment in 1919 of the National Council of Social Service. This is now a semi-official body entrusted with a large sum of public money, that it distributes to suitable charities to provide better social amenities in places like the Distressed Areas, villages, and new housing communities, and to help men and women in the Unemployed and Occupational Centres.

More and more it is coming to be recognized that those who have had the good fortune to be born into happy and healthy surroundings are in honour bound to do all they can to improve the lot of those who, through no fault of their own, have to live in conditions of poverty and ill-health that make the living of a really worthwhile life next to impossible.

Sociology. In 1839 the French philosopher, Auguste Comte (1798–1857), invented this word to denote a science, based on all other sciences, which should discover the general laws underlying human society.

Sociology treats of the origin of society in the simple organization of family and tribe among primitive peoples, and of the growth of customs and morality, of our present day complex society, with its institutions of marriage, property, government, education, religion, organized labour, and many others, and of the problems resulting from city life, poverty, crime, immigration, the clash of races, etc.

These institutions, though by no means fixed, are at least fairly constant. They are the result of much experimentation as to the best way of avoiding trouble and securing peace and happiness. But since new situations are constantly occurring, institutions have to adapt themselves to meet these changes. Modern industrialism, for example, has caused profound changes in institutions and ways of living.

Change the General Rule

Perhaps the most outstanding fact of life is change. Human society always has been, and always will be, changing. Sociology studies these changes and tries to explain them—tries to discover whether they are for the better or for the worse. If the former, then it is called social progress, and sociologists try to find out its nature and causes.

Even among our own people there are many irrational beliefs which we call “superstitions” (*See Magic*). These, too, must be studied and explained. The sociologist does not overlook fads and fashions, for they show, perhaps more than anything else, the effect that living together, watching one another, trying to imitate

one another, has on people. This “following the leader,” this desire to be like one’s neighbours, is a fundamental fact in the science of society.

We are all sociologists, for our work and our play are alike of sociological interest. Few of us are aware of the fact, but an ever-increasing number of people are beginning to make a systematic study of the environment in which they find themselves. A very interesting and useful hobby may be found in the preparation of a sociological survey of one’s home town and of its inhabitants, and finding out all we can about its history, about what its citizens do for a living, how many churches and other institutions there are, and so forth.

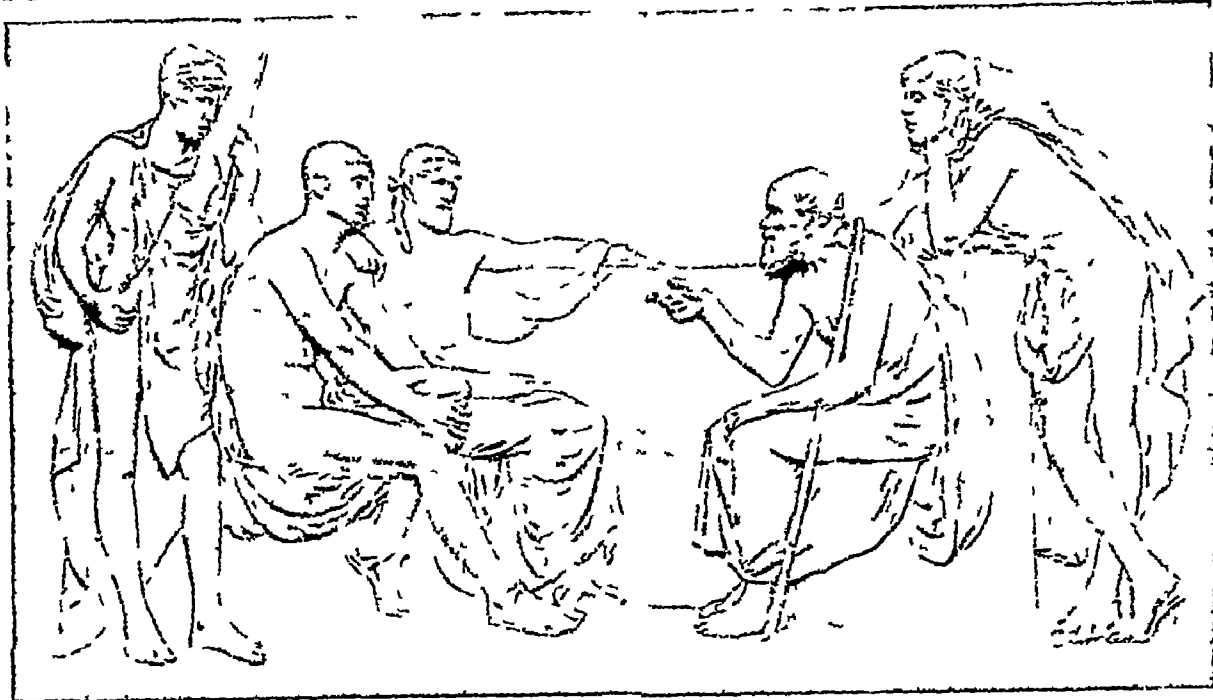
Socrates. (Pron sok'-ra-tēz) (About 469–399 B.C.) The most familiar figure on the streets of Athens near the end of the fifth century B.C. was an awkward man with a squat figure, short neck, bald head, thick upturned nose, round, prominent eyes—the very picture of an old satyr. He wore a single rough woollen garment at all seasons, and went barefooted.

Now and then he would stop some richly dressed solemn Athenian and ask him a simple question or two. The man would perhaps reply with an air of haughty wisdom, as if it were really beneath his dignity to hold discussion with so uncouth a questioner. But presently, as a crowd gathered, the rich Athenian would discover that his grotesque adversary was making him seem absurd by his shrewd queries, and would depart in high anger.

The barefooted speaker was the great Socrates, the wisest philosopher of his time, whose words changed the whole course of human thought, and who is today ranked as one of the greatest moral teachers that ever lived. Despite his uncouth appearance even the beauty-loving Greeks of his day could not resist the fascination of Socrates’ speech. That young and aristocratic military genius, Alcibiades, said of him, “His nature is so beautiful, golden, divine, and wonderful within, that everything he commands surely ought to be obeyed, even like the voice of a god.”

Socrates was born in the outskirts of Athens. He studied sculpture, his father’s profession, but soon abandoned this work to “seek truth” in his own way. His habits were so frugal and his constitution so hardy that he needed only the bare necessities of life, and he was free to devote his time to other things than making money.

Socrates did not know the meaning of fatigue. Once the word passed around that he had been standing in one spot since early morning thinking on some deep problem. The people gathered about to see how long he would remain there. But they had to bring out their beds to rest, for Socrates did not move from the spot until the following morning, when he greeted



THE YOUNG ALCIBIADES LEARNS WISDOM FROM SOCRATES

Bearded Socrates, gesticulating earnestly is trying to convince the youthful Alcibiades seated opposite him. Behind Socrates is another aristocratic young Athenian not so intent on learning wisdom if we may judge from his expression. This relief which is notable for its graceful lines and harmony of composition is the work of the English sculptor Harry Bates (1850-1899)

the sunrise with a smile and moved quietly away. But for all his eccentricities, he was far from being abnormal or unbalanced. He fought like a lion in battle and was commended for bravery on the field of Potidaea (432 B.C.). And he was the most sociable of men, delighting in banquets at the houses of his friends, where he would exchange jokes or talk the profoundest wisdom with equal pleasure.

Socrates' wife Xantippe was notorious in Athens for her sharp tongue and evil temper. The sage once jokingly explained his marriage by saying, "As I intended to associate with all kinds of people I thought nothing they could do would disturb me, once I had accustomed myself to bear the disposition of Xantippe."

Socrates soon learned to shun the artificial philosophy of his day, which led men merely into confusion and doubt. He turned to the voice of his conscience for moral truth and enjoyed nothing better than to confuse with his simple human questions the pompous Sophists, who valued tricks of speech and shallow eloquence above clear and distinct ideas.

"Know thyself," was his motto, and he held that wisdom is virtue, that the wise man is moderate in all things, for only so can he enjoy the keen delights of the mind. He had a sincere desire to expose the absurdities in the life and thought of his time, and he did not hesitate to risk his life for justice.

Although he did not set down a word of his teaching, so far as we know, the details of his life and of his doctrine are preserved to us in the

writings of the historian Xenophon and the great philosopher Plato, both of whom were his pupils. It was chiefly through Plato that the influence of Socrates was passed on to succeeding generations of philosophers. (See Plato Xenophon)

But Socrates was not appreciated by the Athenian mob and their leaders. At last three of his political foes accused him of impiety and corrupting the minds of youth, and he was sentenced to death. At the appointed hour he drank the hemlock, and died as he had lived, a man of unsurpassed courage.

Sodium. Compounds of sodium flow dissolved in your blood and other body fluids. They season your food and lighten your cake. They help to tan the leather for your shoes and to bleach the cloth for your clothes. They form part of the glass of your windows and your table-ware. They probably helped to produce the paper your books are printed on, and to finish your photographs. In short, civilization would be impossible without the compounds of this silver-white, wax-soft metal, which nobody had ever seen or even imagined to exist 125 years ago.

Ever since Nicolas Le Blanc, in 1791, laid the foundation of modern industrial chemistry by discovering a process for making soda out of common table salt (see Acids and Alkalis), the world has had access to an inexhaustible supply of useful sodium compounds.

The compound properly called "soda" is sodium carbonate (Na_2CO_3), which, when

crystallized with water, forms ordinary washing soda. Crude sodium carbonate is called soda ash. "Soda" is used in household cleansing, in manufacturing soap, glass, dyestuffs, and explosives, in other industries of a scientific or technical nature, and as material from which sodium thiosulphate ("hypo") is made for fixing photographic negatives.

Sodium is an alkali metal, a common element, never found uncombined in nature, and familiar in certain peculiar compounds long before it was first isolated by Sir Humphry Davy in 1807. It is intensely active chemically.

The Le Blanc process produces soda by first heating salt (sodium chloride) with sulphuric acid. The sodium in the salt and the hydrogen in the acid change partners, producing hydrogen chloride or hydrochloric acid, and sodium sulphate or "salt cake." The hydrochloric acid is dissolved in water, the salt cake is treated with charcoal and chalk or powdered lime, producing a mixture of sodium carbonate and calcium sulphide called "black ash." The calcium sulphide is not very soluble in water, but the sodium carbonate is, so the two are separated by washing out the sodium carbonate with water.

The hydrogen chloride and calcium sulphide were at first troublesome wastes, but about the time that the Solvay process was put on a commercial basis (1863), the hydrochloric

acid became largely used in industry, and a method was found for recovering the sulphur from the sulphide. The Solvay process (known by the name of the Belgian manufacturers who perfected it) has largely superseded the Le Blanc. It is essentially the treatment of strong ammonia-saturated brine with carbon dioxide gas, forced through it from below.

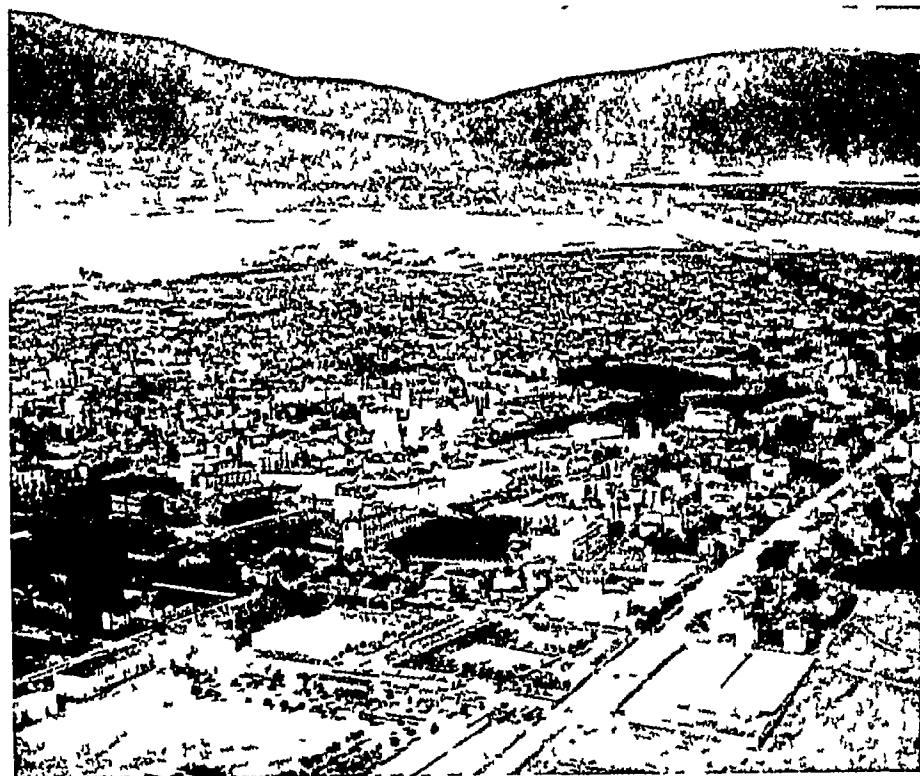
A still newer process is the electrolytic. The salt molecule in salt brine is split by the electric current (*see* Electrolysis) into sodium and chlorine. The sodium atom displaces one of the hydrogen atoms of the water, forming caustic soda (NaOH) and hydrogen gas.

Sofia, (Pron sō-fē'-a), **BULGARIA**. The capital of Bulgaria is not so picturesque as most of the Balkan cities, but is cleaner, more modern, and more progressive. It was almost completely rebuilt when Bulgaria was liberated from the Turks in 1878. Of the old city there still remain the ruined Sofia mosque and the mosque of Buyuk-Jamia, now used as a national museum and library, and the famous baths with hot springs, but the tumble-down houses and crooked streets that belonged to the days of Turkish rule have disappeared.

Situated in a mountain-girt plain, almost in the centre of the Balkan peninsula, at the meeting-place of the principal highways of Bulgaria, and connected by rail with Istanbul, Belgrade, and Thessaloniki, Sofia is a commercial centre and carries on a thriving trade in grain, hides, and attar of roses. The manufactures include silk, cloth, pottery, and tobacco. There is a university, and also military and other schools.

The city stands on the site of the ancient town called Serdica. It was taken by the Bulgarians in the 9th century, was captured by the Turks in 1382, and occupied by the Russians in 1878. Sofia's population to-day is 287,000.

Soil. What is the soil? How is it made? It is the broken and decayed rock on the surface of the earth's crust, mixed with decayed animal and plant matter, and is produced



Dorten Leigh

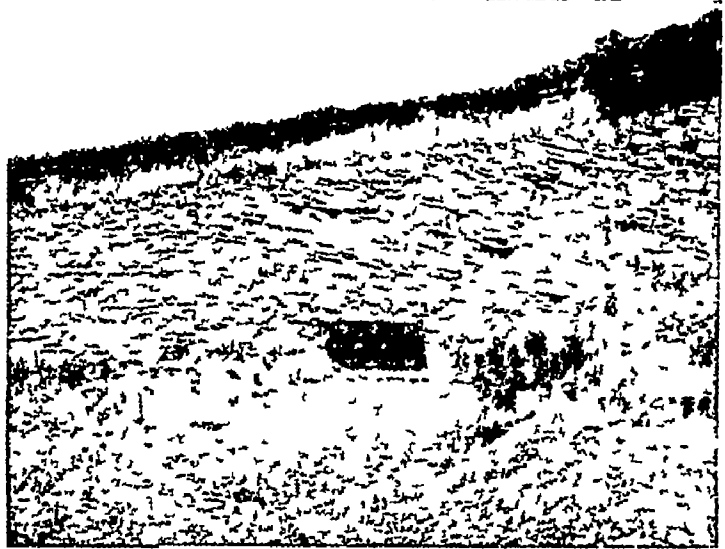
SOFIA SEEN FROM THE AIR

Sofia lies in a plain at the foot of the Rhodope mountains, at an elevation of 1,700 feet above sea-level. In the centre of the photograph is seen the Alexander Nevsky Cathedral, a building with several domes, in the Byzantine style. It is a memorial to the Russians who fell in the war against the Turks in 1878.

SOIL

by the action of wind, water, sun shine, frost, and many other forces

As soon as the surface of a rock has been softened or crumbled by any of these agencies, tiny plants, such as the lichens, fasten upon it. When they decay they form acids which soften and eat into the material of the rocks. Larger plants then gain a foothold, and the roots of a tree may wind themselves over the rock, sending numerous rootlets into the cracks in its surface. The surprising fact is that the pressure of such tiny rootlets may be as great as 200 and 300 pounds to the square inch, so that their combined strength cannot be resisted permanently by even the hardest of rocks.



RICH SOIL FROM LIAS

Above we see a quarry of limestone at Bridgend, Glamorganshire. The strata, clearly shown, are formed of lower lias limestone, lias being the name originally given by quarrymen to the hard limestones at the base of what geologists call the Jurassic rocks named after the Jura mountains where this rock formation is exceptionally developed.

Photo Geological Survey and Museum by permission of H M Stationery Office

Then there is the work of ants, earthworms, and all the varied forms of animal life that burrow through the soil. These till the soil to a greater depth than is reached by the plough of Man, and their tiny efforts are multiplied by their great numbers.

Valuable additions are made to the soil by the decay of both plant and animal life. Bacteria are responsible for the decay and transformation of this material into forms suitable for plant growth. Bacteria also prepare other soil materials, which would not otherwise be available as food for plants, and certain bacteria take the free nitrogen from the air and store it in the soil (See Bacteria, Nitrogen).

There are some seventy known chemical elements in soil, ten of which are essential to the growth of healthy plants. If the soil is lacking in these plant foods, or if the continued removal of crops has exhausted one or more of the essential elements, the composition of the soil must be changed. This is commonly done by the addition of fertilizers (See Fertilizers). Certain elements occasionally found in the soil are harmful to plant growth. Thus very few varieties of plant life can flourish on alkali soils, common where there is little rainfall.

Soils of Different Colours

Soils are of a variety of colours, including black, red, yellow, grey, and even white, depending partly on the colour of the rock from which they were made. Black soils as a rule contain a large proportion of "humus" (decayed plant material), which is rich in plant foods. Sandy soils are often lacking in plant foods, dry quickly, and shift about in the wind, leaving the roots of the plants exposed to suffer from drought. But they are easily worked, and are spoken of as "light" soils by the farmer. If properly enriched by fertilizers and tilling, some sandy soils are very productive.

Clay makes a "heavy" soil that is difficult to work. Moisture causes its particles to stick together, so that it is difficult to get a plough through it, and it also bakes when it dries, sometimes becoming almost as hard as brick. Much clayey soil is very good soil agriculturally. The finer the particles are, the more easily the plant rootlets draw out their nourishment and the more readily water is held in the soil by capillarity (See Capillary Attraction).

Plants are closely related to the soils on which they grow. Certain species cannot live on an acid soil, such as a marsh, whilst others are never found on alkaline soils, such as chalk. The acidity or alkalinity of a soil is a good indication of what crops it is most suited for. The best soil for agricultural purposes contains enough clay and humus to store water and provide plant foods, enough sand to make it pervious to air and to prevent the ground from becoming waterlogged, and enough lime to prevent acidity of the soil. Soils midway between sandy and clayey soils are called "loams". A vegetable loam is a soil containing much plant matter. Some of the best farming lands of the Rhine, Danube, and other river basins are covered with powdery yellowish-grey or brownish loam called "loess".

When soils remain upon the parent rock from which they were made, they are called "residual". Soils carried from their original positions are called "transported" soils. "Alluvial" soils are those moved by rivers. They are found on the flood plains of rivers and in deltas. "Aeolian" soils, such as the sand dunes, were deposited by the wind. "Ash" soils are the accumulation of ashes.



THE JUDGEMENT OF SOLOMON

Here is a reproduction of a painting by William Dyce, illustrating the Bible story of Solomon delivering judgement between the mothers of the dead and of the living child. Both claimed the live child, but when Solomon ordered that it be cut in half, its true mother asked for it to be given to the other woman, rather than that it should be harmed.

National Gallery of Scotland photo W F Mansell

ejected from volcanoes. The soils deposited by glaciers are called "drift" soils.

A knowledge of the character of soils is so important to the farmer and land-buyer that in many countries "soil surveys" by the government are carried on, and samples of the soil are chemically analysed. Then maps are made indicating the composition and fertility of the soils in the areas in question.

Solomon, KING OF ISRAEL (about 960 B.C.)

Nearly three thousand years have passed since King Solomon sat on the throne of Israel, yet his glory is still undimmed and his reign is celebrated as that of the wisest and most magnificent king in Israel's history.

Solomon was little more than a youth when he succeeded his father David. The Bible tells us that God appeared to him in a dream and asked him to express a wish. Solomon prayed only for an understanding heart. God rewarded him by making him not only the wisest king of his age, but the wealthiest and most honoured as well.

The King's Wise Judgement

Solomon showed his wisdom in small and in great affairs. Called upon to decide a dispute between two women who both claimed the same child, the wise king said, "Divide the living child in two, and give half to the one and half to the other." Whereupon one of the women cried out, begging him to give the babe to the other, thus showing that she was the real mother, since she would rather give up her child than have it harmed (1 Kings iii).

Not only his own subjects but rulers from distant lands came to consult Solomon. The

Queen of Sheba, in Arabia, having heard of Solomon's fame, came with a great train, bearing gifts of spices and gold and precious stones. She marvelled when Solomon answered all the questions and riddles which she could put to him.

Princes of many lands formed alliances with him, and he built up a great foreign commerce. With the help of the Phoenicians, trading vessels were sent to Ophir (a land possibly in southern Arabia, famed for its gold) and as far as Tarshish (perhaps a district in Spain). Gold and silver, ivory, apes and peacocks,

horses and linen were among the rich treasures brought to Solomon's realm.

When there was rest from war, Solomon was able to carry out the purpose which his father David had cherished but had been unable to fulfil. After seven years, his magnificent temple, built of stone and cedar of Lebanon, carved within and overlaid with pure gold, was completed and dedicated to Jehovah. Adjoining it Solomon built a splendid palace.

But Solomon had some very grave faults. As the king's character weakened, so did his hold over the people, and his death was the signal for the division of the kingdom.

Solon (about 638-558 B.C.) In the market place of ancient Athens a crowd was gathered about a man who, from his disordered clothing, wild gestures, and flashing eyes, appeared to be mad. Suddenly he broke forth into verse, urging the Athenians to recover Salamis from the Megarians.

The crowd listened with amazement, for so many vain attempts had been made by the Athenians to retake Salamis from the neighbouring state of Megara that in despair a law had been passed forbidding anyone, under penalty of death, to suggest another attempt. Carried away, however, by Solon's appeal the Athenians resolved to make one more attempt to win back the island. They succeeded, and Solon became the hero of the day.

It was to Solon, therefore, that the Athenians looked in another great crisis, brought about by the new development of Athens as a commercial state. Great fortunes were being made in trade, while the lot of the labourer and

SOLON

peasant became harder and harder. The people elected Solon to the office of archon, and gave him power to draft a new code of laws.

Solon ordered all those enslaved for debt to be freed, forbade future loans on the security of a debtor's person, and cancelled all debts thus secured. He set a limit to the amount of land which a man might hold. He also improved everyone's chance of securing justice by a law providing that one who had lost a lawsuit could appeal again to a jury of citizens. He admitted every man, even the humblest, to serve on this jury and take part in the meetings of the assembly, and gave him a voice in the election of the magistrates, thereby laying the broad foundation of Athenian democracy.

Although the revolution which Solon had sought to avoid did finally take place, with the result that Peisistratus, a member of a powerful noble family, seized supreme power, Solon's ideals of law and justice and democracy remained a powerful influence throughout Athenian history, and thus on all democracy.

Solon was one of the Greek wise men whom the ancients honoured by calling the Seven Sages. The names of the others usually included in this list are Thales, Periander, Pittacus, Cleobulus, Bias, and Chilon.

Somerset, ENGLISH Co. This south western county (1,621 square miles in area) washed on the north by the Bristol Channel and the Severn estuary, consists of moorland, marsh, valley, and hill regions, the chief ranges being the Mendips, in which are the famous Cheddar and Wookey Caves, and the Quantocks. Dunkery Beacon (1,707 ft.) is the highest point. In the west is Exmoor Forest—made famous by Blackmore's romance, "Lorna Doone"—noted for a peculiar breed of ponies and for its wild red deer, preserved for stag hunting. The chief rivers are the Avon (the "Bristol Avon") and the Parret.

Apple orchards abound, cattle and sheep are reared, and wheat, barley, and oats are grown. Manufactures include cider, woollen and worsted goods, silk, gloves, and crape. Coal is mined.

SOPHOCLES

The county town is Taunton (pop., 37,300), and other important towns are Bath (*qv*), Bridgwater, Wells, and Yeovil. Bristol lies partly within the county, and Weston-super-Mare and Minehead are watering places of note. Wells Cathedral is one of the finest in the kingdom, at Glastonbury is a magnificent ruined abbey, and nearby is one of the few "lake villages" in the country. Near Bridgwater the Battle of Sedgemoor was fought in 1685.

The county is important today in the wireless world, with a B B C station at Washford Cross and a post office station at Portishead. Its population is about 475,000.

Sophocles. (Pron. *sof' o-klēz*) (c. 495 B.C.—406 B.C.) Whereas Aeschylus (*qv*) remains unsurpassed for sublime poetry and Euripides (*qv*) for ingenious plots and dramatic realism, Sophocles, the second of the great trio of Athenian tragedians, outshines both his rivals in artistry. His greatness lies in his keen psychological insight. He both intensifies and humanizes tragedy by insisting upon the elements in it which are due to the



ANTIGONE IN A PLAY BY SOPHOCLES "F. Manetti"

Antigone, the subject of a famous play by Sophocles, was a daughter of Oedipus. Her brothers, Polyneices and Eteocles, quarrelled over the division of the kingdom when their father died, and slew each other. This painting, by Victor Robertson, shows Antigone performing funeral rites over the dead body of Polyneices.

moral conflict between human wills. He "saw life steadily and saw it whole." His serenity of attitude, together with the supreme skill with which his dramas were constructed, the beauty of his language, and the nobility of his characters, give us a sense of majesty and harmony such as we find nowhere else in literature. He was the most Greek of all Greek poets.

Sophocles and the Drama

In construction as well as in spirit Sophocles freed the Greek drama from the bonds of a religious festival. He was the first to introduce a third character on the stage, thus making the development of the plot more simple and supple, and increasing the range of the dialogue and action, as well as giving wider opportunity for the display of his acute psychological insight. He also increased the number of the chorus from 12 to 15, but his choruses have no part in the action of the play, and speak merely the incidental, if highly beautiful, odes on which his reputation as a poet rests. Although several of his plays are concerned with Oedipus, he broke away from Aeschylus' irritating habit of composing a group of three plays on one theme, and made each of his tragedies a complete entity, in which the players alone develop the action, while the chorus "points the moral and adorns the tale."

Sophocles was born at Colonus, a suburb of Athens, the son of a well-to-do worker in metals, and his long life covered practically the whole

of Athens' golden age, the age of Pericles. At the age of 15 he was chosen for his beauty to lead the chorus which sang the song of triumph for the Greek victory over the Persians at Salamis (480 B.C.), and he was long famous for his graceful interpretation of Nausicaa, the "royal laundry maid," in the representation of the legend of the landing of Ulysses. He received the usual education of the Athenian gentleman, and made his first appearance as a dramatist in 468 as the rival of Aeschylus, who was his elder by 30 years. His play, the "Triptolemus," won the first prize, Aeschylus being placed second. Twenty times he won the first prize. In all he wrote about 130 plays, of which only seven still exist. Sophocles was first defeated in the dramatic competition by Euripides in 441, but he remained until his death the most popular tragedian with the people.

The seven plays of Sophocles comprise the "Antigone," "Electra," "Trachiniae," "Oedipus Tyrannus," "Ajax," "Philoctetes," and "Oedipus Coloneus," of which the best-known are the first, fourth, and seventh, dealing with the hereditary curse of the house of Oedipus. The "Antigone," which is perhaps the most celebrated drama in Greek literature, is typical of Sophocles' work. Its heroine is a model of womanly self-sacrifice, and underlying the whole tragedy is the sublime idea of a higher unseen law ruling the destinies of men.

The VIBRATIONS *we call* SOUND

Have you ever asked yourself why it is that we see a flash of lightning long before we hear the peal of thunder? The answer to this question, and many more facts about sound, are to be found in this article

Sound. Like light and heat, sound is a wave motion. Sounds generally reach our ears through the air, and consequently the study of sound is chiefly the study of vibrations in air caused by various vibrating bodies.

One very important difference between light and heat vibrations and sound vibrations is that the former are transverse (crosswise), while the latter are longitudinal (lengthwise). We often represent sound waves by a wavy line—and very satisfactorily, too, provided we remember that such a line does not show the path of the particles of air. This path is really a straight one, each particle moving backwards and forwards with and against the direction in which the wave is moving.

Compared with light, sound is a laggard. It travels one mile in about five seconds at 32° F., the speed increasing a little over one foot a second for every degree rise in temperature. We see distant lightning long before we hear the peal of thunder, because light travels so much faster than sound (186,000 miles a second).

You can easily tell how far away a storm cloud is by counting the number of seconds between the flash and the thunder. Each second means about 1,100 feet. In water sound travels about four times as fast as in air.

The general mechanism of sound can be understood by dropping a book on a table. When it strikes, the air between the book and the table top is suddenly squeezed out. Now air, thin as it is, has elasticity, as you know from the way the handle of a bicycle pump bounces back after being pressed, if you have plugged the outlet. Therefore when the air driven from between the book and the table strikes the nearby air, this is first compressed and then bounces outward, striking in turn the air farther away, and so the impact is passed on. If we are in the vicinity, this outward impact passes our ears, and in passing, strikes upon the ear drum. The nerve endings in the ear (see Ear) respond by causing our brains to "hear" the book striking the table.

Just as air yields to the pressure on it, so does the table, although, since the wood of the table

SOUND

is much denser than the air, the amount of yielding is far less. Since wood is reasonably elastic, this impact travels through it. If you place your ear against the end of the table, you will "hear" the sound as the impact comes through the wood.

Likewise sound travels through water, as you can demonstrate by holding your head under water, and making someone strike the surface near by. All sounds, in fact, are caused in just such a way as that described—by some violent impact upon matter which sets up a strain in some elastic medium, this medium then transmitting the strain to where it can strike your ear, causing you to hear.

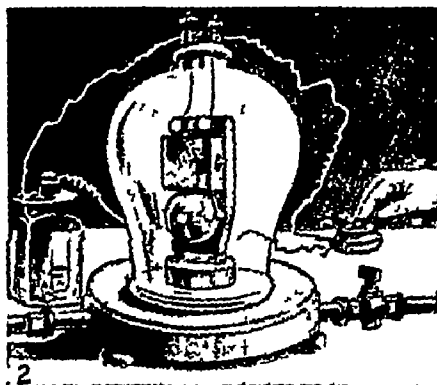
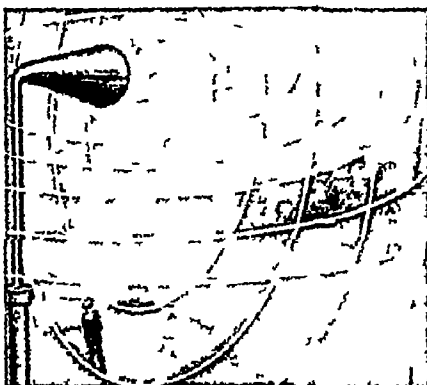
All this may raise the question, "Why, if displacement of matter causes sound, do we not hear a noise when we just move a book from one place to another without dropping it?" The answer is that such a disturbance can be adjusted by air flowing around the book, without any "impact" radiating outward as part of the adjustment. Sound results when the displacement is so sudden and violent that the compensating adjustment can only be completed by means of this outward radiation.

What has been said explains the meaning of the scientific statement that sound travels by "longitudinal" pulses, and how this can take place regardless of whether the molecules are rigidly fixed in place,

as in the wood in a table, or are freely flying, as in air. In all cases, the molecular motion is to and fro. The particles of the transmitting medium move to and fro, each over its own range, striking repeatedly those next to it. When the particles are pushed together, they form a zone of *condensation*, when they move back and spread out, they form a zone of *rarefaction*. The rate at which the condensations and rarefactions take place is called the *frequency* of the wave. The greatest distance each particle travels away from its original position is called the *amplitude* of the wave.

It is a natural tendency of elastic materials to "spring back" into their original positions

after displacement, and in doing so to overshoot the mark. Then they spring forward again, and gradually, by this to and fro action, come to rest. This behaviour underlies the distinction between *noises* and musical *notes*. The slap of a falling book, the bang of an explosion, consist principally of one great "compression" wave, followed by more or less regular disturbances as the transmitting medium settles to rest. Such a sound is a noise. But the prongs of a tuning fork, the strings of a violin, and the vocal cords of the throat give forth a whole series of regular impulses. When this



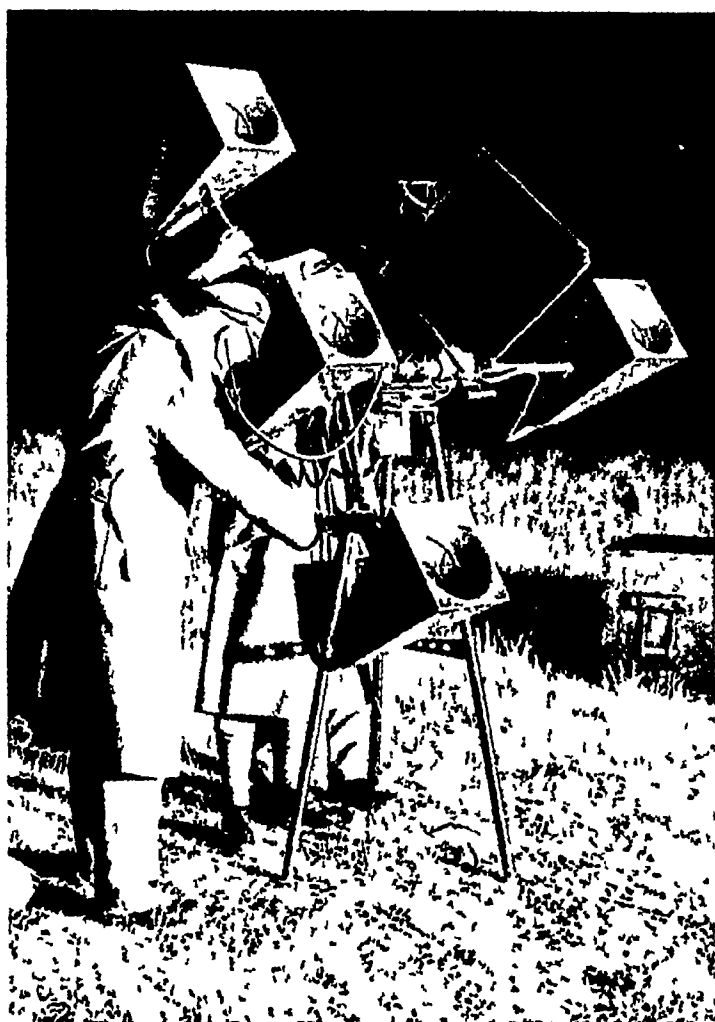
SOME FACTS ABOUT SOUND WAVES AND ECHOES

When vibrations are set up in the air, as in 1, by a foghorn, the vibrations travel as sets of great circular waves in all directions. An electric bell in a vacuum jar shown in 2, is almost inaudible, proving that sound is not carried through a vacuum. The overlapping sets of waves made on the surface of the pool by the dipping swallows in 3 illustrate how sound waves in the air may cross one another in a similar way without interference. An echo is produced, as in 4, when sound waves are reflected by some obstacle, just as water waves strike the shore and roll back again.

series strikes the ears of listeners its sustained regularity causes it to be heard as a note.

The lowest frequency the ear can perceive is between 16 and 29 vibrations per second, and the greatest audible frequency lies between 20,000 and 30,000 per second. The range of true musical notes is from between 30 and 40 vibrations a second up to 4,000 a second.

Perhaps you have noticed that a locomotive whistle rises to a shrill shriek as the train approaches, and dies away with a mournful wail as it departs. The whistle is emitting vibrations at the same rate all the time, but your ear in the one case receives the vibrations crowded together into shorter waves, and in the second



Keystone

AT AN ANTI-AIRCRAFT LISTENING POST

Aircraft can be located by sound as well as by sight. Sensitive sound-locators, as seen above in action during night exercises, are used by listening "spotters." Distant faint sounds are caught by these "mechanical ears" and magnified by amplifiers, as sounds are in a wireless set.

they are dragged farther and farther apart into longer waves. This is known as the Doppler effect.

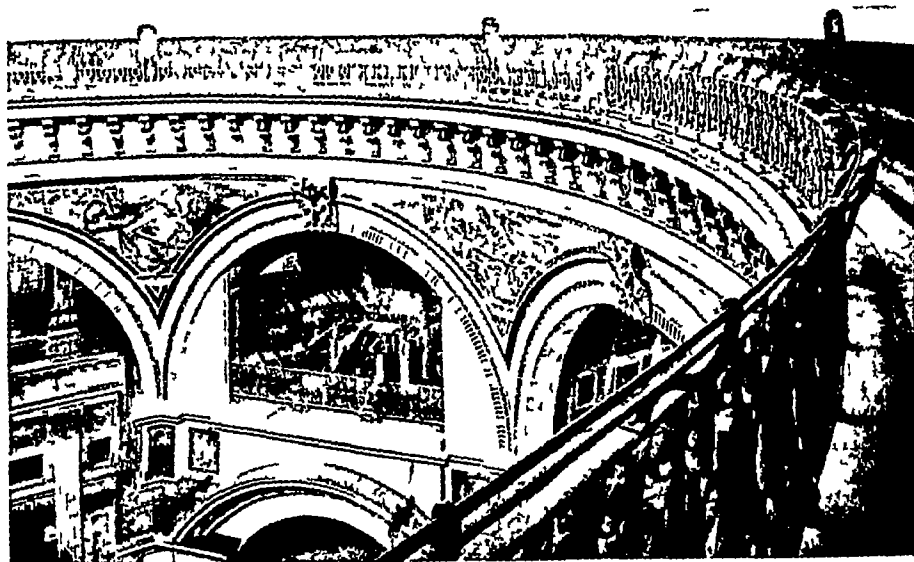
Men have always found certain notes, and combinations of notes, pleasing to hear, and used them to produce music. It happens that notes which sound well together always have frequencies in simple ratios to one another. Thus a note which is an octave above another has twice the frequency of the first.

Modern music employs a system of intervals centring

about a note called "middle C," which in natural tone would have a vibration rate of 256 a second. In 1887 an international congress in Vienna adopted an "international pitch," also called "French pitch," giving this note $258\frac{2}{3}$ vibrations a second. "Concert pitch," sometimes employed by soloists to increase brilliancy, gives this note 270 vibrations a second. The other notes are fixed at the proper vibration rates to give the intervals used in music.

Resonance Explained

The fact that most vibrating bodies have a natural "period" in which they tend to vibrate underlies the phenomenon known as *resonance*. The action may be compared to that of setting a swing in motion. If you start it going, and then give a little push each time it reaches the end of a swing, before long it will swing widely. Likewise feeble air waves of the proper period will set a string or other elastic body vibrating. You can prove this by humming a note into a piano, meanwhile depressing the loud pedal. Then stop humming, and your note will be given by the proper string, resonance having set it in motion. Empty sea shells also give "the sound of the sea," some sound of proper period having set their columns of air in vibration by resonance. Von Helmholtz (1821-1894) used this principle in his "resonators," hollow metal objects resonant to different pitches, with which



WHERE A WHISPER IS HEARD A HUNDRED FEET AWAY

Above is seen the famous "whispering gallery," which runs around the interior of the dome of St. Paul's Cathedral. The slightest whisper against the wall on one side of the gallery is distinctly heard at the point opposite, although the distance is more than a hundred feet. The explanation is that the great dome acts as a mighty sounding-board.

Photo F. Kerating

he detected the overtones of musical instruments and gave us our explanation of tone quality

The sounding-board of a piano and the body of a violin are added to these instruments to strengthen the notes given by the strings through resonance. In each pipe of an organ, a vibrating jet of air strikes the edge of the opening at the correct frequency to give a note of the desired pitch, and the tube is of the right length to reinforce the note by resonance. In wind instruments such as the flute, the length of the resonant column is adjusted by opening holes in the side of the tube.

Because sound is produced by waves, it can be focused, refracted, and reflected like light. In certain large buildings, as in the dome of St. Paul's Cathedral (*q v*), sound is so focused that a whisper at one end can be distinctly heard at the other. Perhaps the best-known example of reflected sound is the echo (*q v*).

Powerful sounds, like the firing of artillery, sometimes fade out and come again into hearing at greater distances, having been reflected from

clouds. The repeated reflection of sound, echoing to and fro, is called *reverberation*. A certain amount of reverberation in a hall enriches the tone and gives life to the voice, but a little more gives a disturbing and irritating effect, and prevents clear hearing. Reverberations may be practically stopped with the use of draperies or sound absorbing wall materials. Planning rooms to control echoes and reverberations is a part of architectural acoustics.

The fact that sound can be reflected is used in various types of "depth finders" to measure great ocean depths. An electric oscillator gives out a sound, and a receiving apparatus, reminding one somewhat of the lift indicators in an office building, flashes on a light opposite the figure for the depth, when struck by the echo. Interference, or cancelling of sounds, is responsible for the "beats" which give a throbbing quality to tone when two similar sources of sound are vibrating at almost the same rate. The number of beats is equal to the difference in frequency of the notes.

From CONGO to CAPE of GOOD HOPE

In the land of veldt and bush, Briton and Boer, once bitter enemies, now work in harmony, building together a great Dominion of the British Commonwealth. Here is the story of South Africa from its first settlement

South Africa.

The story of South Africa is a story of bold explorers and hardy settlers on unfriendly coasts, of battles against pygmy Bushmen using poisoned arrows, and against Kaffir and Zulu giants wielding huge shovel-headed spears. It tells of conflicts with wild beasts, of the discovery of gold and diamonds, of the bitter clash of Boer and Briton in the wilderness, of devoted mis-

sionaries who carried civilization into desert and jungle, and finally of peace and prosperity. The land in which this stirring drama was played is shut off from the ocean by ramparts of hills that rise from low-lying coasts step upon step, with barren terraces or "karoos" between. The hills ascend until suddenly the whole vast region opens out into a great plateau from 4,000 to 6,000 feet above the sea, stretching far away to the northward. Here is the treeless, grass covered, rolling "veldt," and the rough scrub or "bush," where stunted acacias, dwarf

Extent—(Including Mandated Territory of SW Africa), 790,625 square miles. Total population, 9,500,000. The Provinces of the Union of South Africa are Cape of Good Hope (277,000 sq. m., pop., 3,500,000), Natal (35,000 sq. m., pop., 1,940,000), Orange Free State (49,000 sq. m., pop., 766,000), and Transvaal (110,000 sq. m., pop., 3,300,000). Native Protectorates (not within the Union): Basutoland (11,000 sq. m., pop., 560,000), Bechuanaland Protectorates (275,000 sq. m., pop., 265,000), and Swaziland (6,700 sq. m., pop., 155,000).

Physical Features—Great interior plateau of "veldt" country, with mountains close to and parallel with the coast. Series of gradually rising terraces—the Karoo Drakensberg Range (rising to 11,000 ft.) between Natal and Orange Free State. Chief rivers: Vaal, Orange, Limpopo.

Principal Products—Wool, maize, sugar, cotton, tobacco, citrus fruits, gold, diamonds, coal, copper, tin, wines, ostrich feathers.

Chief Cities—Johannesburg (Transvaal), 519,000. Cape Town (Cape Province), 344,000. Durban (Natal), 259,000. Pretoria (Transvaal), 128,000. Port Elizabeth (Cape Province), 109,000.

mimosas, and bitter aloes fight for life in the dry soil.

Sheltered from the moist ocean breezes, the climate is bracing and healthful. Game of all kinds was formerly plentiful, and if lions and leopards made travel dangerous, there were numberless antelopes—including the springbok, modern symbol of the Union—buffaloes, zebras, and giraffes to provide meat for the hunter. In the more tropical regions along

the east coast the elephant, the hippopotamus, and the rhinoceros are still found in small numbers. There are several game reserves, including the huge Kruger National Park in the Transvaal. (See also the article on Africa.)

South Africa was found in the 15th century by Europeans who were seeking an ocean highway to the rich commerce of India. Bartholomew Diaz, the Portuguese navigator who discovered the Cape of Good Hope in 1488, and Vasco da Gama, who reached India by that route ten years later, as well as the scores who

SOUTH AFRICA



VAST LAND OF VELDT, MOUNTAIN AND FOREST

The mountain ridges skirting the eastern coast of South Africa trap the moisture from the ocean, leaving the interior and the west coast arid. With the exception of the two Portuguese colonies of Angola and Mozambique, and the fragment of the Belgian Congo, all the territory shown on the map above is included within the bounds of the British Commonwealth.

followed in their wake, looked upon this vast southern projection of the "Dark Continent" merely as something they had to go round on their way to the "land of spices and silk." They only stopped for wood and water or to repair the damage done by the Cape storms.

It took a shipwreck to bring about the first settlement. Dutch sailors, driven ashore in Table Bay, near the Cape of Good Hope, in 1648, were compelled to forage for themselves for several months. Rescued and returned to Holland, they gave such a good account of

their discoveries that in 1652 Jan van Riebeeck, for the Dutch East India Company, established a fort and a plantation in the shadow of Table Mountain. More settlers followed, and in 1687 a number of French Huguenot families threw in their lot with the Dutch colonists.

The hardy pioneers of Table Bay soon tired of the petty tyrannies of the Dutch East India Company. By 1720 they had begun their "treks" or migrations. They pushed over the northern hills or followed the mountains towards Natal, as the south-east coast had been called

SOUTH AFRICA

by Vasco da Gama, setting themselves up as independent farmers, vine growers, and cattle raisers

In the Cape region the colonists had encountered the Hottentots, a friendly easy going race of blacks, many of whom were soon enslaved. But as they reached farther into the interior, they came upon natives of an entirely different spirit. In the western part of the great plateau lived the Bushmen, a race of dwarfs, shrewd and freedom-loving. The colonists ill treated these tiny people, and many a white man died from their poisoned arrows. The Bushmen were hunted down, but they refused to make peace, and today scattered remnants of them live in the Great Kalahari desert.

Kaffirs on the War-path

Towards the east coast were the Kaffirs, giants in stature, strong, intelligent, and well organized. Once aroused to the fact that the white men were trying to seize their territory, these Kaffirs hurled themselves upon the intruders with their great assegai spears, and fought with a courage and ferocity never surpassed among savages.

Meanwhile the Napoleonic wars in Europe had made Great Britain and Holland enemies and the British seized Cape Colony in 1795, returned it to the Dutch in 1803 but took it back again in 1806. Finally, in 1814, Holland, for the sum of £6,000,000, surrendered all claim upon Cape Colony.

There were at that time in the Cape region about 27,000 "Boer" settlers as the colonists of Dutch descent were called from the Dutch word for "farmer." Most of them strongly objected to their new rulers. Great Britain, in 1820, settled 4,000 of her own citizens in the colony, and British missionaries soon began interfering with the harsh treatment of the natives by the Boers. Finally, in 1834, slavery was abolished by a general law of the British Parliament, and bitter resentment at this loss of the foundation of their prosperity spread among the Boers.

In 1836 began the "Great Trek," when 7,000 Boers emigrated from Cape Colony into the great plains beyond the Orange River, and across into Natal, and beyond the Vaal River into the Transvaal. There these farmers and cattle raisers set up independent republics. In Natal they failed, for this province had been colonized some years before by the British, and it was officially declared a colony of Great Britain in 1843.

After recognizing the independence of the Transvaal in 1852, the British attempted to annex it in 1877, partly on the ground of internal anarchy and the danger from the formidable military power of the Zulu chief, Cetawayo, and partly to forward the federation of all South Africa into one British dominion. Three years later the Boers took up arms. On February 27, 1881, they severely defeated the British forces at Majuba Hill, killing the general in command. Thereupon Gladstone, who had now become Prime Minister, withdrew the British claims to the Transvaal, and the Boers regained self government under British suzerainty. The British, in 1879, had fought and conquered King Cetawayo and his trained army of 40,000 Zulus. The conflict shook the foundations of British rule in South Africa, but in the end the British were victorious and the Zulu military system was broken up.

In 1869 the Kimberley diamond-fields were discovered on the western border of the Orange Free State, and in 1886 came the discovery of the rich gold-fields of the Witwatersrand in the Transvaal, the richest and most productive gold-field in the world. There was a rush to these regions from all parts of the world by

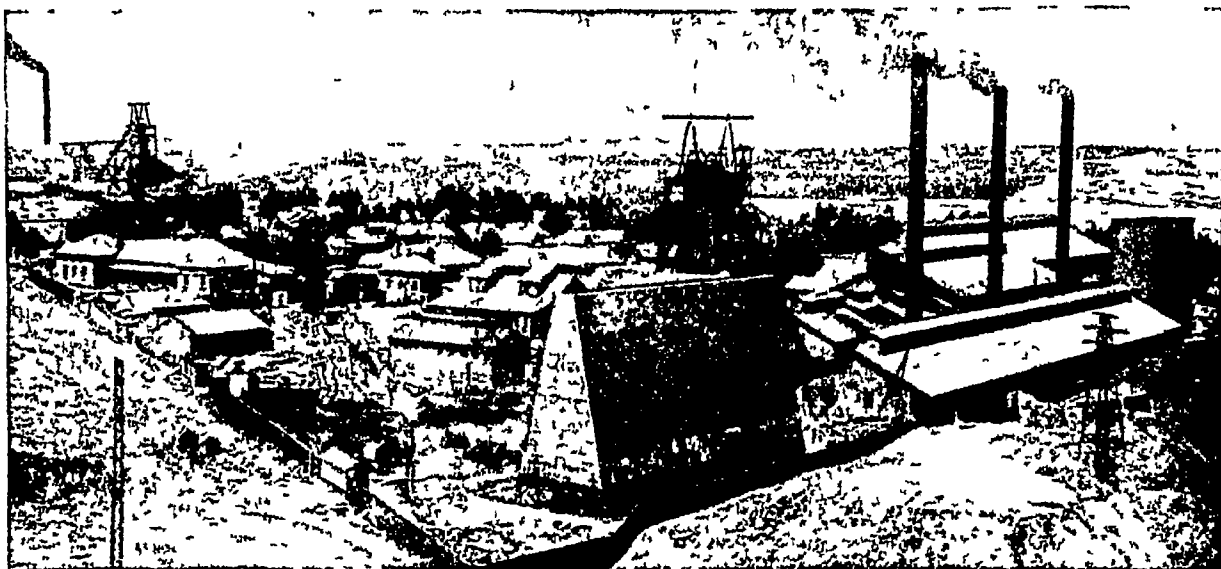


HOME OF AN EMPIRE-BUILDER

Groote Schuur, his old home at Rondebosch near Cape Town, was left by Cecil Rhodes in trust to be the official residence of the Prime Minister of the Union of South Africa, although the Union was not accomplished until eight years after his death. It is built in the Dutch colonial style.

Photo by courtesy of South African Railways

SOUTH AFRICA



JOHANNESBURG, CENTRE OF THE GOLD-MINING INDUSTRY

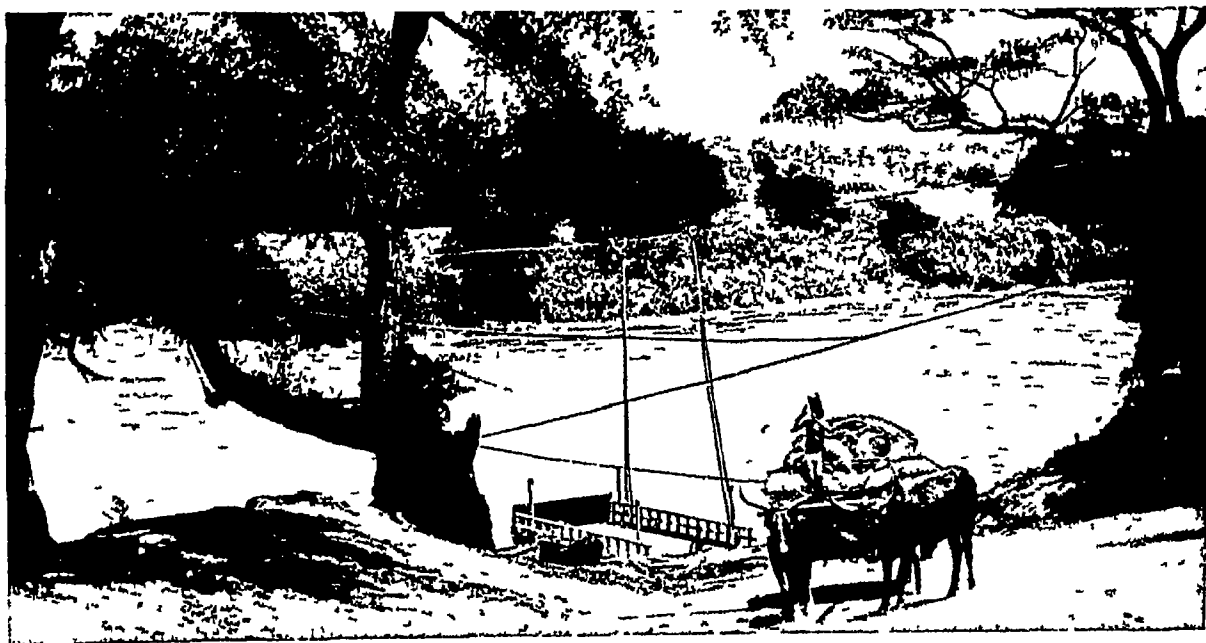
The section of the city in which the gold mines are situated looks just like any other mining town. But the residence and business sections are those of a modern city, with fine broad avenues and substantial buildings. The city was founded in 1886, and is now the largest city in South Africa, with a population of about 325,000.

adventurers, gamblers, promoters, young men seeking their fortunes, and older men looking for serious investments.

Thriving industrial centres suddenly grew up in the midst of the wilderness at Kimberley, Johannesburg (*qv*) and other places. Their population increased rapidly, and South Africa saw the spectacle of these energetic progressive settlements of "utlanders" (foreigners) surrounded on all sides by the old-fashioned primitive Boers, who were opposed to change and asked only to be allowed to continue their free life of patriarchal simplicity on the open veldt. Meanwhile, the commanding figure of Cecil

Rhodes appeared in South African politics (*see* Rhodes, Cecil) with his dream of a great empire under British rule extending northward into Central Africa. The Boers, however, under Paul Kruger, President of the Transvaal, organized anti-British sentiment into the "Afrikander Bond"—Afrikander being the term applied to whites of Dutch descent born in South Africa.

Rhodes, who had already established British authority over that vast central portion of South Africa north-west of the Transvaal known as Bechuanaland, now organized the British South Africa Company, which took over Mashonaland in 1890 and conquered Matabele-



A FERRY ON THE TUGELA RIVER IN NATAL

A cable over the stream keeps the ferry-boat in its course, while the ferry-man poles his flat-bottomed vessel across. Tugela is one of the short rapid rivers which rise in the Drakensberg and flow east into the Indian Ocean. Eight miles north of the Tugela is Ladysmith, which was besieged during the Boer War of 1899-1902.

RURAL SCENES IN SUNNY SOUTH AFRICA



A Zulu village or 'kraal,' such as you see in the top photograph is circular in form the huts being grouped around a central open space, in which are kept the most valuable possessions of the tribe—the cattle. After the World War, changes in fashion gave the ostrich-farming industry a serious setback, but there is still a sufficient demand for feathers to keep some farms going, like the one in the middle. The bottom photograph shows a large citrus farm in Natal, South Africa is a great fruit exporting country and such plantations as this are found everywhere.

Photos by courtesy of South African Railways



IN SOUTH AFRICA'S GREAT GAME RESERVE

The Kruger National Park had its origin in a sanctuary for game which was founded in 1898 by Paul Kruger, President of the South African Republic (Transvaal), and was then known as the Sabi Reserve. It was later considerably enlarged and in 1926 was constituted a national park. The park measures about 220 miles by 40 miles, and lies along the Union side of the Portuguese East African border. Above are seen zebras and wildebeests drinking at a water-hole.

Photo by courtesy of South African Railways

land, taking it from the native chiefs in 1893. These regions lie today in Southern Rhodesia, between the Limpopo, the Zambezi, and Mozambique. The Boers were now hemmed in.

The "utlanders" on the "Rand," the Johannesburg gold district, complained bitterly against the laws of the Transvaal Boers, which discriminated against them in many ways, and made it virtually impossible for any foreigner to obtain any voice in affairs. Then Joseph Chamberlain became British Colonial Secretary. Aided by Rhodes, he supported the British claims to the utmost.

War between Boer and Briton

In 1895 occurred the ill-fated raid on the Transvaal, led by Dr. Jameson, and the wave of bitterness that it aroused rapidly hurried the Transvaal and the Orange Free State into war with Great Britain. Hostilities broke out in October, 1899, and after two and a half years of hard fighting the British were victorious. (See Boer War and illustration in page 564.)

Out of this conflict came a period of reconstruction and the gradual growth of friendly feeling. This culminated in the granting of self-government to the Boers in 1906, and in 1909 the Union of South Africa was formed, which

included the Provinces of the Cape of Good Hope, Natal, the Transvaal, and the Orange Free State. The Union was given self-government under a Governor-General appointed by the British Crown.

When the economic depression hit the Union in the early 1930's, General Hertzog, the Prime Minister, and his previous opponent, General Smuts, decided that the only way to improve conditions, and to bring racial peace in the country, was by forming a new joint party. This, the United Party, was formed in 1934. The defences of the Union have been greatly improved since the party came into power.

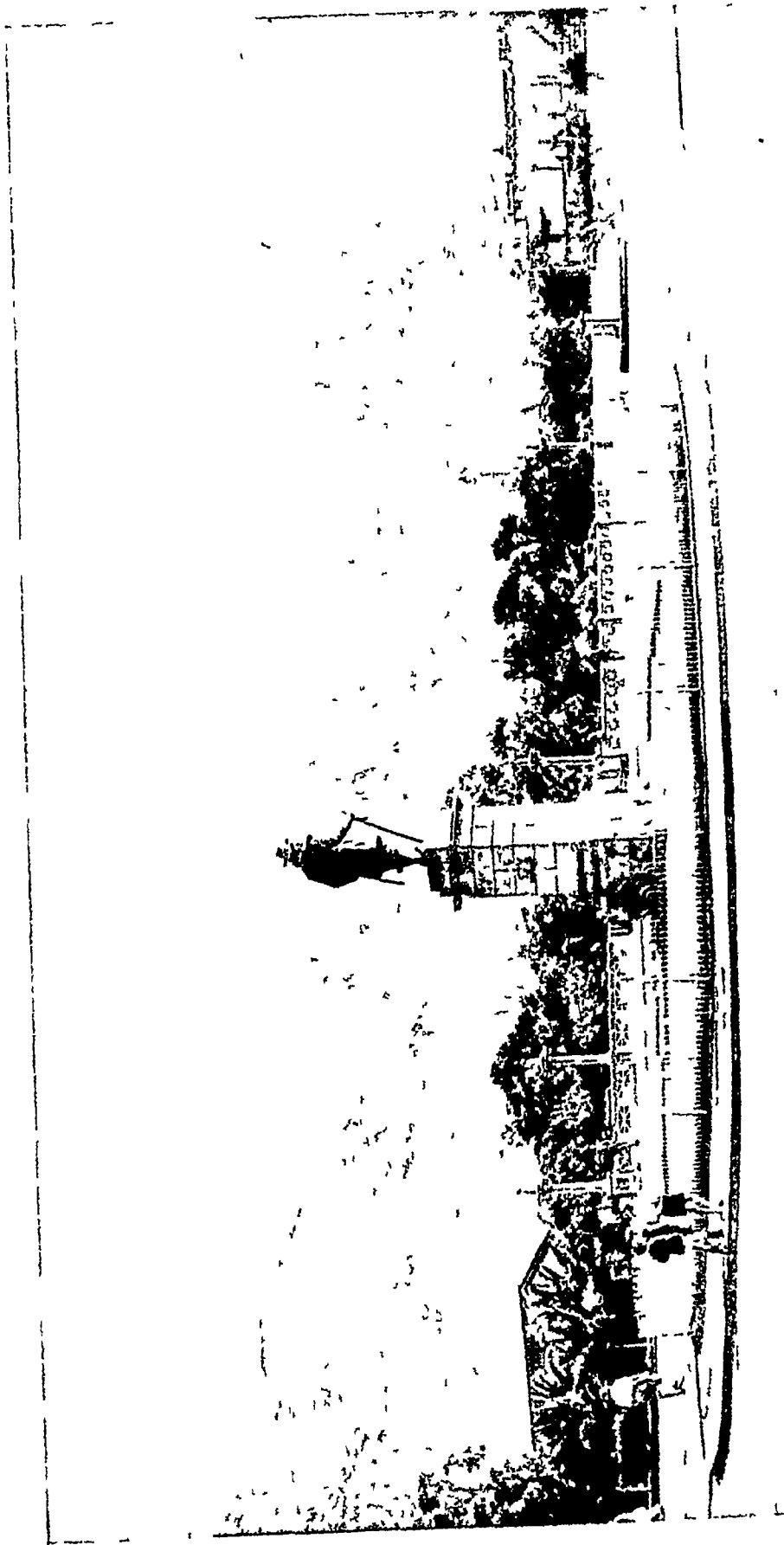
The Union of South Africa has an area of a little over 472,000 square miles. This does not include South-West Africa, the former German Colony. The population is over 9,500,000, less than one-fourth being white. Its capital is Pretoria, but the legislature meets at Cape Town. The capitals of the four provinces are Cape Town (Cape of Good Hope), Pietermaritzburg (Natal), Pretoria (Transvaal), and Bloemfontein (Orange Free State). English and Afrikaans are both official languages, but the common law is the Roman-Dutch law of the Boers.



E. Hudson

GRANDEUR OF THE VICTORIA FALLS

Among the many natural wonders and beauties of Rhodesia the most spectacular is beyond doubt the Victoria Falls, on the Zambezi river. Here is the section over 500 yards wide known as the Rainbow Fall where the waters falling abruptly into a vast chasm, throw up vast clouds of fine spray in which a perpetual rainbow is seen.



Union of South Africa

MEMORIAL TO THE DUTCH FOUNDER OF CAPE TOWN, THE GATEWAY OF SOUTH AFRICA

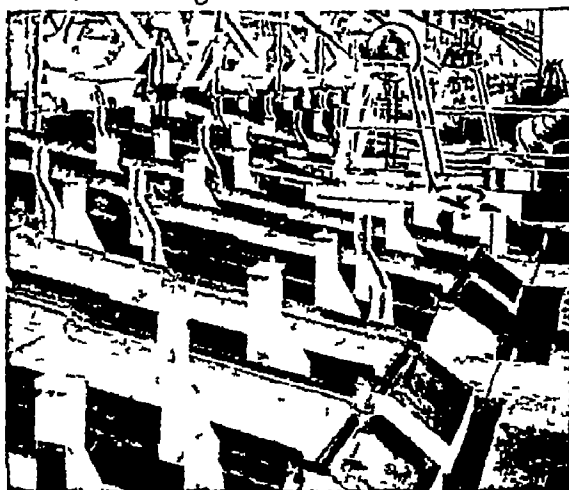
This statue of Jan van Riebeeck, the Dutch surgeon who, in 1652, founded the first white settlement at the Cape of Good Hope, stands on the esplanade at Cape Town, looking out over Table Bay. Towering above the city is Table Mountain, generally covered by a great white cloud, called locally "the table-cloth". The city lies in an amphitheatre between Table Mountain and the Lion's Rump, the northernmost of the hills of the Cape Peninsula.

SOUTH AFRICA

Minerals form the greatest source of South Africa's wealth. Gold is found chiefly in the Transvaal and diamonds are produced in quantity from the famous Kimberley and Pretoria fields. Large coal deposits in the Transvaal and Natal yield millions of tons of coal every year, while the copper mines of the Cape of Good Hope are famous.

On the veldt and Karoo pasture lands the finest breeds of sheep graze, and, since the days of the early Boer shepherds, wool growing has been the leading agricultural pursuit. Angora goats are raised for mohair. The cattle and dairy industry received a strong impetus from the World War, and butter became an important article of export. A picturesque, though dying, branch of the live stock industry is ostrich farming, which is carried on in the Cape Province. Until irrigation was undertaken in 1877, the cultivation of grains and fruits was confined to the better-watered area. At the present time nearly 1,000,000 of the 2,500,000 acres of irrigable land are receiving water.

The largest crop is "mealies" (Indian corn), but wheat is making rapid strides. Oats, Kafir corn, forage crops, and fruits are grown in the south, while on the coast of Natal sugar-cane, tea, and other semi-tropical crops flourish. Because of the drought-resisting properties of cotton, increasing areas are devoted to it.



DIGGING DIAMONDS ON THE RAND

Above is the 'Big Hole' at Kimberley the most extensive open diamond mine in the world—450 feet deep and 38 acres in circumference. Mining there has been discontinued since 1909 owing to the falling in of the sides. Top right, are pulsator tables, which are greased to catch the diamonds.

Photos by courtesy of South African Railways

The conditions brought about by the World War greatly stimulated manufacturing, which had previously been confined chiefly to flour, meats, tobacco, wines, and brandy. Now the tanning of leather and making of tanning extract from wattle bark are becoming important, as is the manufacture of cement, clay products, vehicles, furniture, etc.

Geographically, South Africa includes, in addition to the Provinces of the Union, Rhodesia (*q v*), South-West Africa (*q v*), and the native Protectorates of Basutoland, Bechuanaland Protectorate, and Swaziland. These three territories are now under the administration of a single High Commissioner, with a Resident Commissioner in each. There are very few Europeans in the Protectorates, and the native tribes largely govern themselves with little outside help.

BASUTOLAND, which occupies an area to the south-east of the Orange Free State, is a mountainous country, but has the best grain lands and excellent pasturage for cattle and sheep. It has been British territory since 1868, when Moshesh, the first "paramount" chief of Basutoland, appealed for protection. Many thousand Basuto have left their own country to work in the mines or on the farms of the Union. The chief town is Maseru.

BECHUANALAND PROTECTORATE, by far the largest of these areas, should

SOME SCENIC GRANDEURS OF SOUTH AFRICA



At the wild romantic headland, Cape Point, seen in the upper photograph, two oceans—the Atlantic and the Indian—are said to meet. This rocky promontory rises 850 feet above the sea, and at its base is a column known as Vasco da Gama's pillar, in memory of the discoverer of Natal. Cape Point is not far from the British naval base of Simonstown. Below are seen the picturesque Howick falls in Natal, where the waters dash over a steep precipice on the Umgeni river.

Photo by courtesy of South African Railways



BLACK BEAUTIES OF SWAZILAND

While the Swazi women pay comparatively little attention to costume they are very fastidious about their hair, and will spend a long time arranging one another's coiffure. Swazi women are not allowed to let their hair grow until they have prospects of being married. The coiffure, especially when it takes the form of the "bee-hive" which you see here is very elaborate, and for dressing the hair porcupine quills are used.

Photo by courtesy of South African Railways

not be confused with British Bechuanaland, which is part of Cape Province. The greater part of the Protectorate, which was declared British in 1885, consists of the Great Kalahari desert, where big game is plentiful. There is swamp and grass land further north. The largest town is Serowe (population, 28,000).

SWAZILAND, lying at the south east corner of the Transvaal, provides winter grazing for flocks of sheep from that Province. The capital

of Swaziland is a small town called Mbabane. In 1910 the whole of the government railways were brought under the control of the Union Government, and the entire system now has a length of over 13,000 miles. The through air service for passengers and mails between London and Cape Town came into operation in April, 1932. The route from East Africa now follows the coast, and has its terminus at Durban. There are connexions to the principal cities in

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the Union by the air liners of South African Airways (See also the separate articles on each Province and the chief cities in the Union)

South African Literature. The literature of South Africa is comprised under two heads—that written in English, and that written in Afrikaans

With regard to the English part, much that is not strictly by South Africans was written from the early 17th century onwards by travellers, naturalists, explorers, and missionaries, David Livingstone's "Missionary Travels and Researches in South Africa" (1857) is perhaps the best-known

Of South African writers properly so called, undoubtedly the most famous in fiction is Olive Schreiner (1862–1920) Her "Story of an African Farm" (1883), brought to England by the author and submitted to George Meredith, then reader to a publishing firm, achieved an immediate success upon publication This vivid and sensitive study of South African life far exceeded in literary quality any of her later writings Among these are the volume of stories, "Dreams" (1891), "An English South African's View of the Situation" (1899), where she urged the claims of the Boers, and "Woman and Labour" (1911) which showed her strong feminist attitude Gertrude Page, who died in 1922, depicted in many very popular novels life on the farm in Rhodesia

Sarah Gertrude Millin is a well-known writer of today "God's Stepchildren" (1924) portrays for European eyes the inevitable problems created by the contact of white races with the black Her biography of General Smuts was notable, and she has also written a life of the great South African pioneer Cecil Rhodes

Perhaps some of Sir Rider Haggard's work ought to be included in the literature of South Africa It was after all from his residence in the country that the impulse came to him to compose his Zulu stories Such thrilling tales as "King Solomon's Mines," "Jess," and "Swallow" have been read wherever English is spoken His masterpiece, "She," also has an African setting

One young writer of great promise is Pauline Smith, of a deep sympathy and sincerity She has published a volume of short stories under the title of "The Little Karoo" (1925), and also to her name are "The Beadle" (1927) and "Platkops Children" (1935)

A famous book of recent years is The life and Works of Alfred Aloysius Horn ("Trader Horn"), edited for this hardy and whimsical "old-timer" of South Africa's wilds by Ethelreda Lewis, and published in 1927 Another more recent still is "Turning Wheels" (1937), Stuart Cloete's novel (his first) of Boer life which became a best-seller in the USA and Britain

The father of South African poetry was Thomas Pringle (1879–1834) His poem "Afar in the Desert" (1828) was considered by Coleridge one of the three or four most perfect lyrics in the language Pringle's love of Nature, his passion for freedom, and his full understanding of the spirit of the South African native mind, vividly shine in poems like

those entitled "The Lion Hunt" and "The Bechuana Boy"

Of the younger poets, Roy Campbell (b 1902), with his sense of literary colour, strong individuality, abounding, almost primitive vitality, and, moreover, a powerful faculty of self-criticism and objectivity, is acknowledged the greatest of



DEATH OF TWALA

Of all Sir Rider Haggard's works his Zulu stories are the most popular Above is illustrated one of the most exciting scenes in "King Solomon's Mines," when Sir Henry Curtis slays Twala, King of the Kukuanas, with the monarch's own axe

By permission of Cassell & Co Ltd

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his generation. He first came into notice with "The Flaming Terrapin" (1924), then followed, among other volumes, "Adamastor" (1930), and "The Georgiad," a satire (1931). Famous poems of his, powerfully calling up the vast spaces of the veldt and its untamed life, are "The Zebras" and "A Veldt Eclogue the Pioneers." The poem "Tristan da Cunha" is an example in a more pensive and mature vein.

"The Centenary Book of South African Verse" (1925), edited by F. C. Slater, contains the poems of 68 writers, most of them still living.

There is a sense in which Rudyard Kipling has been regarded as the foremost English poet of South Africa, for he spent much time in the country and knew it well, as his South African poems demonstrate. Like Tennyson before him, he has certainly had a great influence on the younger school of South African poetry. Edgar Wallace's "Writ in Barracks," which is a frank imitation of Kipling, was largely composed in his South African days.

Finally, we must not omit to mention for its profundity and world-wide reputation as a contribution to modern philosophy the "Holism and Evolution" (1926) of General Smuts (*qv*), one of South Africa's greatest men.

In Afrikaans, the literature of South Africa received its special impetus after the Boer War. Before this, the Afrikaner poetry of F. W. Reitz was highly praised by Kipling. Then came a new generation of poets, some of outstanding merit in the lyric style, like Jan

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Celliers ("Die Vlakte," 1906), Totius ("By Die Monument," 1908), Louis Leipoldt ("Oom Gert Vertel en Ander Gedigte," 1911), in the narrative style, C. J. Langenhoven, and A. G. Vissen.

Langenhoven, whose first initiative later led to the recognition of Afrikaans as an official language by the Union Government in 1918, is also one of the foremost novelists and prose writers, with a wide appeal among the Afrikaans reading public. Another well-known prose writer is A. A. Pienaar, whose "Uit Oerwoud en Vlakte," published under the pseudonym of Sangiro, is a sensitive piece of work on the tragedy of animal life in Africa's forests. It has appeared in English as "The Adventures of a Lion Family."

In addition to Langenhoven, amongst novelists and short story writers are J. H. H. der Waal, D. F. Malherbe, Leon Mare, J. van Bruggen, and E. de Roubaix—all with established reputations, the work of van Bruggen especially being very fine.

Also to the high credit of Afrikaans authorship is that semi-scientific, highly original story, "The Soul of a White Ant" by Eugene Marais (1872-1936). It has been translated into English by Winifred de Kok and most of the critics have paid tribute to the genius of its author, who was a voluminous contributor to "Land and Volk" for many years. His poem, "Winter Nag," is described by his son as the herald of the new Afrikaans movement.

SOUTHERN HALF of the NEW WORLD

Continent of great rivers, vast forests, and far-stretching plains, South America can boast of unlimited natural resources. This most exotic of the Americas is the subject of the following absorbing article.

South America.

This continent tapers to a point at the south, and spreads out wide in the north, in the tropics, where four-fifths of its whole area lies. It is traversed by a great mountain chain from north to south near the western coast—the Andes. These are the highest mountain mass on the globe, with the exception of the Himalayas, and Mount Aconcagua, on the boundary between Chile and Argentina, is the highest peak in the Western Hemisphere. Very rich in minerals, the Andes have one great drawback. Volcanic eruptions and earthquakes are frequent among them, and some times destroy whole cities.

Extent—about 7,310,800 square miles. **Population**, about 80 millions.

Natural Features—Mountains. Andes, lower coastal mountains of Brazilian and Guiana highlands. Highest peak, Aconcagua, 22,860 feet. Largest rivers. Amazon, Parana-Plata, São Francisco, Orinoco. Largest lake, Titicaca, 3,800 square miles.

Principal Products—Sugar cane, cotton, coffee, tobacco, wheat, rubber, cacao, Brazil nuts, gold, silver, nitrate, borax, tin, diamonds, etc., wool and cattle products.

Political Divisions—Republics. Argentina (capital, Buenos Aires), Bolivia (Sucre), Brazil (Rio de Janeiro), Chile (Santiago), Colombia (Bogotá), Ecuador (Quito), Paraguay (Asunción), Peru (Lima), Uruguay (Montevideo), Venezuela (Caracas). Colonies. British Guiana (Georgetown), Dutch Guiana (Paramaribo), French Guiana (Cayenne).

On the eastern side are the Brazilian highlands, and between the western and eastern ranges is a great plain, drained by the mighty river Amazon (*qv*).

The valley of the Amazon in the torrid zone is for the most part a vast unexplored jungle covered with rich forests of valuable woods, adorned with flowering vines,

and carpeted with a dense undergrowth. The Amazon basin once supplied nearly all the world's rubber, but this industry is now of small importance. Among other forest products are beautiful woods for furniture and Brazil wood for dyeing. Large parts of South America lying in the torrid zone are so cold that little will grow

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there, for it is height above sea-level, rather than nearness to the Equator, that determines their temperature. Many regions in the heart of the tropics are so high that the mountains are covered with snow.

The temperate regions lie farther south. Enormous quantities of wheat and other grains are grown on the immense farms in Argentina, and great herds of cattle, sheep, and horses roam the wide treeless plains or "pampas." Here the seasons are reversed, because, owing to the tipping of the earth's axis, the South Pole points to the sun when the North Pole is turned from it. People travel south for

the summer and north for the winter. The very heavens are also different. The North Star, which is always visible in northern latitudes, is not seen below the Equator, while the Southern Cross is a beautiful constellation that people in the north can never witness.

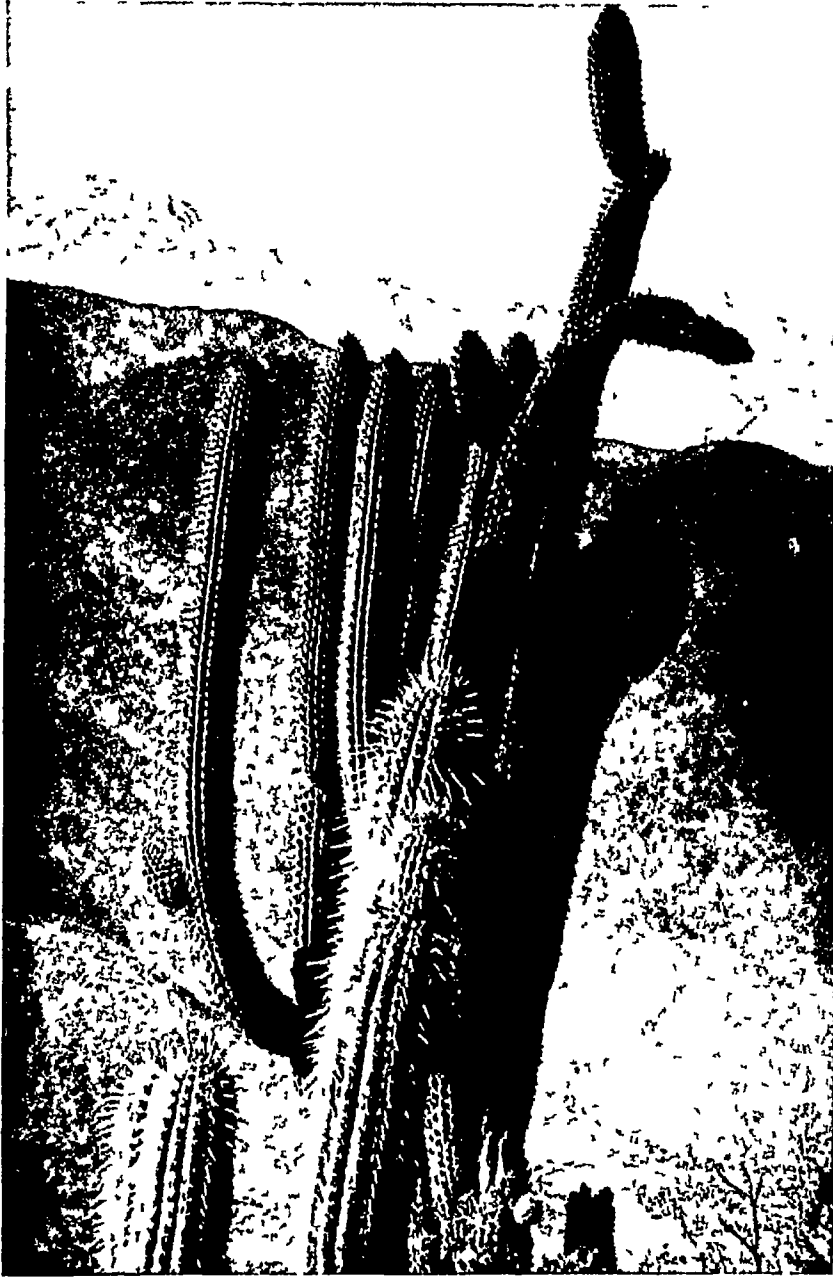
At the southern end of South America is a bleak and sparsely inhabited region known as Patagonia, with large sheep walks. Between Patagonia and Tierra del Fuego is the Strait of Magellan, the route taken by most steamers going round the continent. This route is rocky, and some sailing vessels prefer to risk the storms round Cape Horn.

The main island of Tierra del Fuego is the largest island near the continent, and, in fact, the only one of any importance, except Trinidad (one of the West Indies), north of Venezuela, and the group of Falkland Islands, about 300 miles east of Magellan Strait, both of which belong to Britain.

South America has a remarkably regular coast-line, except in southern Chile, where the coast reminds one of the fiords of Norway. The lack of good harbours is a great disadvantage to commerce, making it necessary in some places for ships to load and unload some distance from the shore by means of lighters. This lack of harbours is partly compensated for by the great river systems, which are navigable for thousands of miles. There is, moreover, no finer harbour in the world than Rio de Janeiro.

Pará, in northern Brazil, is the largest rubber port on the continent. At Bahia, on the east coast, the warehouses contain tobacco, cacao, and sugar, and at Santos, just south of Rio de Janeiro, the air is heavy with the odour of coffee. From Magallanes, the southernmost city in the world, boats carry great cargoes of wool.

Travelling up the coast of Chile you see ships waiting for cargoes of nitrate, to be used for fertilizer,



Dorlen Leigh

A DISTANT GLIMPSE OF THE ANDES

The volcanic range of the Andes varies in character from beautiful wooded alpine country to bleak desert plateau. The highest peaks stand on either side of the boundary between the Argentine and Chile, dominated by Aconcagua (22,860 ft.), seen in the background of the photograph above. In the foreground is a magnificent specimen of the decorative tree cactus.

VARIED TYPES OF SOUTH AMERICAN NATIVES



1 These are the wife and daughters of a prosperous Chilean farmer 2 An Indian flower vendor of Caracas, Venezuela 3 A Chuncho chief of Brazil is painting his face the Chunchos are forest tribes 4. Cowboys ("gauchos") of Argentina in gala attire 5 Notice the peculiar headress of this Aymara Indian of Bolivia, one of the tribes which live in the uplands or sierras. 6. This native Indian of the interior of Peru is carrying her baby in the shawl around her shoulders, while an older boy looks on. 7 The native women of Paraguay make cigars—and smoke them, too

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gunpowder, and iodine. From Peru cotton and sugar are carried north in large quantities, and from Ecuador are exported thousands of pounds of cacao, from which chocolate and cocoa are made, and cinchona bark, from which quinine is obtained.

The Latin-American lives a rather leisurely existence, and turns his attention to politics, literature, and the arts rather than to business. In many of the countries ignorance, poverty, and superstition prevail among the great mass of the people, but the wealthier and educated classes represent the best of European culture, and a real Spanish-American literature and art is growing up.

Buenos Aires, Santiago, Montevideo, and Rio are very much like the capital cities of Europe, with motor-cars, electric tramways, many-storeyed buildings, and European styles in dress. Outside the large cities, however, the costumes and customs of the people have changed little since the days of the conquistadores, or conquerors, like Cortes and Pizarro.

The Spanish and Portuguese conquerors found the New World peopled everywhere by native tribes. Unlike the fiercer Indians of North America, these natives were docile and used to regular labour. The conquerors easily subdued them, using them at first to work the rich mines and later to till the plantations, upon which the Spanish proprietors settled and lived a life of ease. The pure Indians who remain are still not entirely free, many being held in "peonage."

The distinctively Latin-American race is a mixture of the Indians and whites, who have intermarried freely. This class is known as "mestizos" (half-breeds), and includes the majority of the population. Many of the cultured leaders of South America point with pride to their Indian ancestry, especially if it can be traced to the Incas.

No section of the world holds greater opportunities for the future than South America.

Its vast agricultural areas are only awaiting development. Transport, too, is backward. Most of the people who live in the mountains travel on foot or by mule, and goods are carried by llamas. Of recent years, however, South America has been making great strides. Every country now has at least one railway. The marvellous Transandine railway, connecting Chile and Argentina, pierces the Andes by a tunnel at a height of 10,000 feet. Improvement in transport and communication between South and North America has played an important

part in the development of its resources. The Panama Canal brought the riches of the west coast thousands of miles nearer to the markets of eastern America and Europe. The aeroplane has shortened to hours or days former journeys of weeks or months over high rugged mountains, through steaming jungle forests, or across pathless plains. Air mail is flown from western Europe, and also from New York and Miami across the Caribbean Sea to the Canal Zone and thence to the leading west coast cities, then it crosses the mountains and the pampas from Santiago to Buenos Aires, cutting several days from the fastest steamer schedule.

South America abounds in minerals. Most of them are found in the Andes, along the entire western coast, though many occur in the Brazilian plateau. Since the coming of the

Spaniards an enormous amount of silver has been taken from the mines of South America, and this is still one of the most abundant of the metals in the Andes. Gold, too, is found in many places, although not in great quantities. Copper abounds in Bolivia, Peru, and Chile.

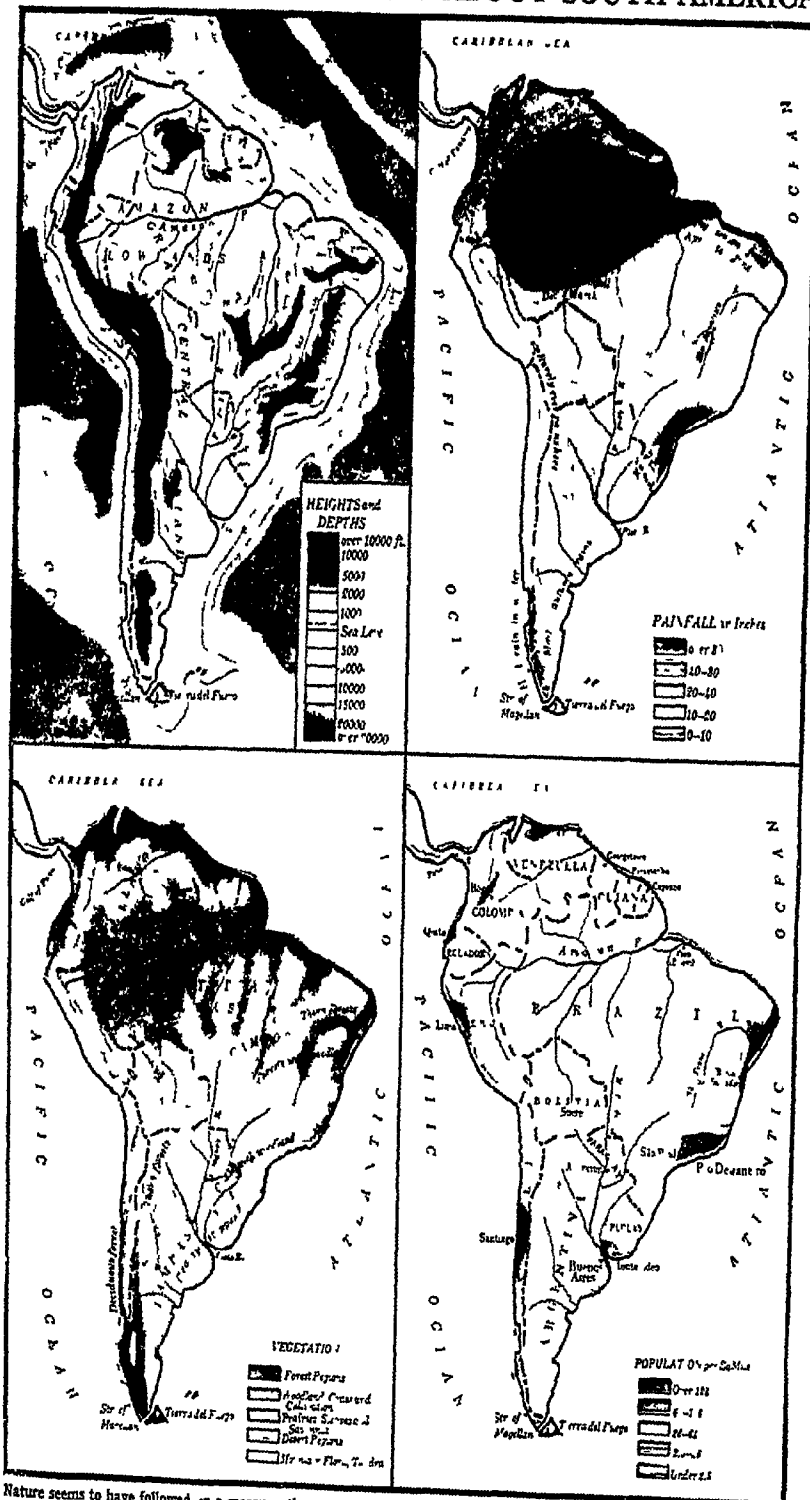
The nitrate deposits in northern Chile long supplied practically all the world with fertilizer, nitric acid, and iodine. Colombia furnishes most of the world's emeralds. Diamonds and thorium are found in Brazil, tin, nickel, bismuth, and borax in Bolivia, and vanadium and wolframite in Peru. The asphalt lakes of Trinidad and



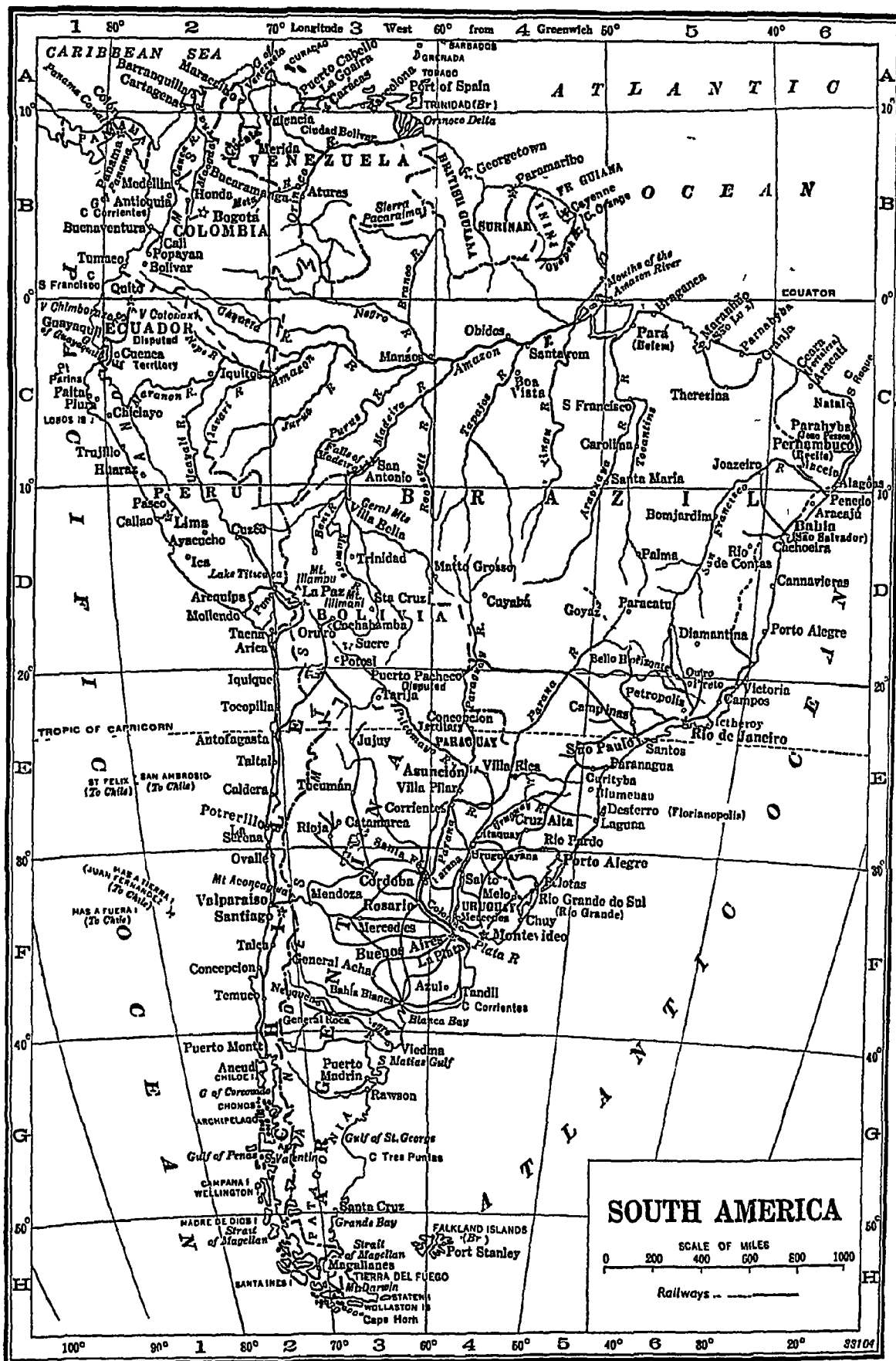
RAILWAY MARVEL OF THE ANDES

One of the outstanding achievements of modern engineering is the Transandine Railway which links Chile with Argentina. At one point it passes through a tunnel 10,000 feet up. Here is seen the track amidst a snow-cut, with the Andes towering in the background.

FACTS YOU SHOULD KNOW ABOUT SOUTH AMERICA



Nature seems to have followed in a measure, the same pattern in building both North and South America. On the west are the young rugged mountains in the east the old worn-down ranges, with plateaux and lowlands between. Notice how the densest vegetation occurs in the regions of heavy rainfall, and how the most thickly-peopled districts are scattered on or near the eastern and western coasts.



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FOUR SOUTH AMERICAN CREATURES

Top left is the curious toucan, top right is a family of collared peccaries, fierce members of the pig tribe, left bottom, an albino rhea, a local representative of the ostrich group, and, finally, a tree boa.

Photos F W Bond W S Berridge "The Times"



Bermudez are unparalleled. There are also vast deposits of petroleum, and Venezuela now ranks high in the world's oil production. The present mineral output of South America, however, gives only a hint of the future.

The mainland of South America was discovered by Columbus. The rumour in Mexico of a rich empire to the south aroused the ambition of the Spaniards, and caused Pizarro to enter Peru with a few hundred followers. Here he discovered the Incas (*qv*). Finding the kingdom in the throes of a civil war, the Spaniards had little difficulty in conquering it.

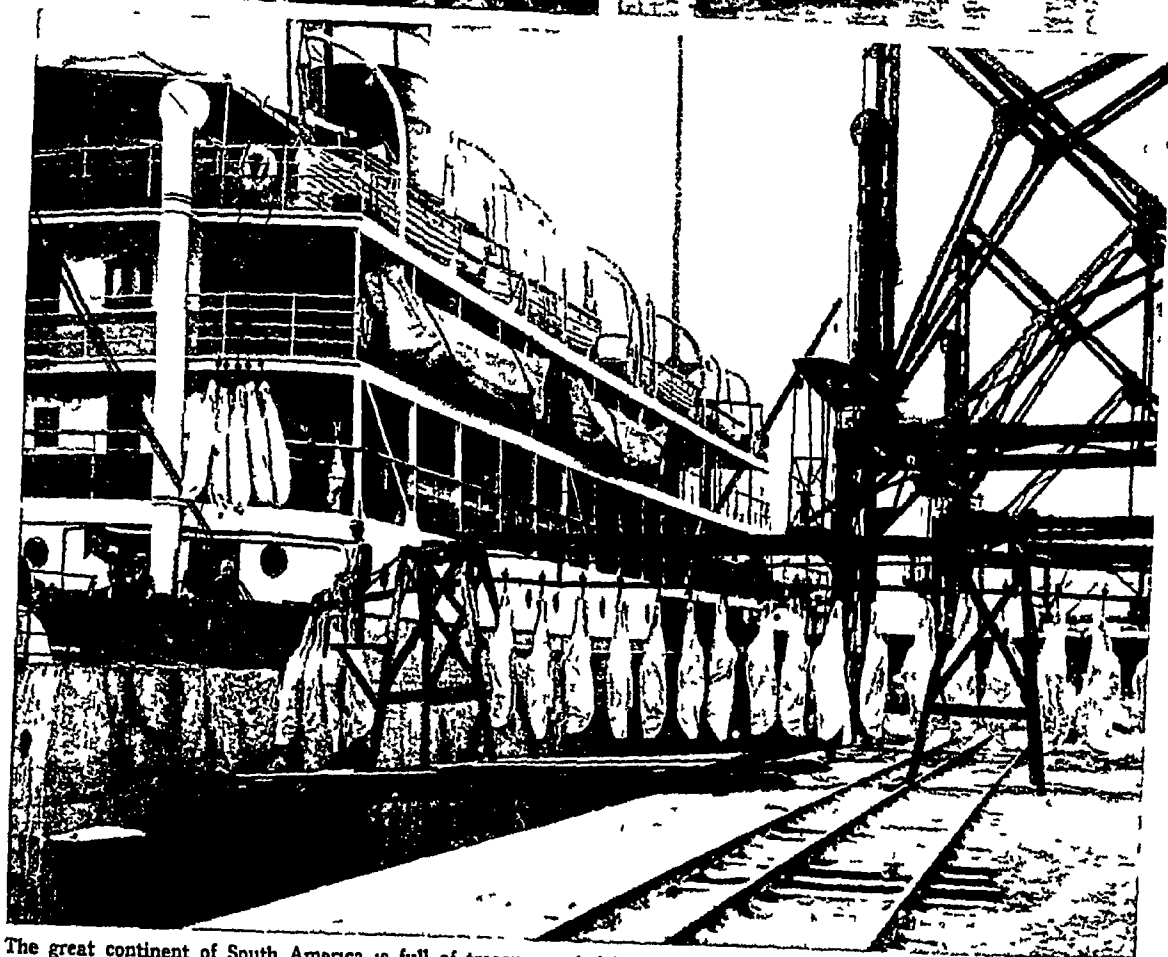
With the exception of Brazil, the greater part of South America was under the rule of Spain for some 300 years after the sailing of Columbus. In 1810 the colonies began their struggles for independence. The enthusiasm of Simon Bolivar (1783-1830) and the heroism of José de San Martín (1778-1850) helped to bring them to a successful conclusion before 1825. Each group became gradually independent, and republics were formed. Brazil, which had severed its connexion with Portugal in 1822, remained an

independent empire until a revolution in 1889 made it, too, a republic. The Guianas are now the only places on the mainland remaining under European control.

Though Latin American republics have used the United States government as a model, their institutions have not worked with the smoothness found in the northern nation. Dictatorships and revolutions have frequently disturbed the course of representative governments. There is no educated middle class in most of these countries to provide a controlling weight of public opinion, and the politicians of the upper class have often been able to exploit the government and the ignorant Indian peasants for their own profit. Hence it has often happened that a dictator and his party have ruled a nation until they were forced out of power by revolution.

In international affairs South American countries have shown a tendency to submit their disputes to arbitration, and were among the first to join the League of Nations (though some have since dropped away). Closer relations between the South American countries and other

SOURCES OF THE WEALTH OF SOUTH AMERICA



The great continent of South America is full of treasure and riches, and it is said that no other place on earth holds greater opportunities for the future than this southern half of the New World. Here we have photographs of three workaday scenes. In the top left picture is shown a Brazilian extracting Brazil nuts from a pod, afterwards they are washed and sorted for shipment. On the right workers are seen diamond washing near Diamantina, Minas Geraes. The bottom photograph shows an endless procession of sides of chilled beef going aboard a steamer at La Plata.

Photos top left and bottom E. N. A.

SOUTH AMERICA

nations of the Western Hemisphere are promoted by the work of the Pan American Union, which was organized at Washington in 1890, and arranges for Pan-American Conferences held every five years

South American Literature. Spanish is the predominating language of South America, and when we talk of South American literature Spanish-American literature is generally implied. This had its origin about four hundred years ago in the letters and reports of the conquest of Spanish America sent back to Spain and Portugal by both missionaries and the "conquistadores," as the early conquerors of the land are termed.

By the end of the 16th century Mexico and Lima had become centres of intellectual activity, and an epic poem by the Chilean Pedro de Oña, entitled "Arauco domado," was published at Lima in 1594. The 17th century was notable for the plays of the Mexican Juan Ruiz de Alarcón, and the mystical poetry of Sor Juana Inés de la Cruz (1651-1695).

Little of outstanding importance was produced during the 18th century, but it is interesting to note that the "El periquillo sarniento," of José Joaquín de Lizárraga (1774-1827) is considered the first real American novel.

The numerous revolutions of the early part of the 19th century produced a flood of patriotic verse, such as "La Victoria de Junín," by José Joaquín Olmedo, and the "Himno del desterrado" of the Cuban José María Heredia. Once the revolutionary period had passed, the poets, detesting all things Spanish, turned their

SOUTHAMPTON

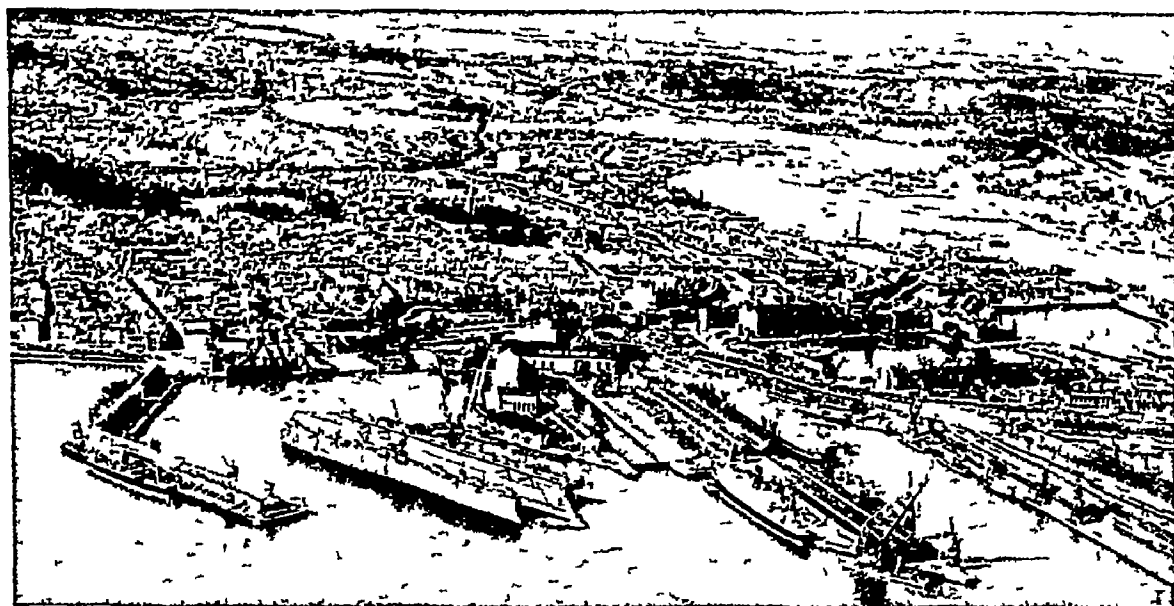
attention to native themes. Towards the latter half of the century the "Gaucho poetry" made its appearance in the Argentine, and the life of the gaucho became valuable literary material.

Within recent times two forces have modified the course of Spanish-American literature. One is the "modernista" movement, seeking to enrich poetry, and the other, "Americanismo" or "Criollismo," which deals with nationalism.

Among modern South American writers the best known are the Nicaraguan Rubén Darío (1867-1916), great poet in the classic tradition and a critic whose worth is acknowledged by the entire Spanish world, José Enrique Rodó (1872-1917), a Uruguayan known as the "Latin Emerson", Florencio Sánchez (1875-1910), the Argentine dramatist, and the novelists Gonzalo Febres, Carlos Reyles, Martín Aldao, and Manuel Gálvez.

Southampton. At the head of Southampton Water, with the Isle of Wight standing guard at its entrance to the English Channel, the town of Southampton is primarily concerned with the trade of the British Empire and passenger shipping to North America. From its vast acreage of docks, which can accommodate the largest liners and are owned by the Southern Railway, much of Great Britain's import trade travels by railway 79 miles north-east to London, and exports of cotton, linen, woollen, and worsted goods, machinery and hardware start on their long journey. The harbour is also the temporary base of the Empire air services.

The town lies on a peninsula of Hampshire between the rivers Itchen and Test. In ancient



SOUTHAMPTON—ENGLAND'S GATEWAY IN THE SOUTH

"The Times"

Seventy-nine miles from London is Southampton, one of Britain's busiest and most progressive ports. Largely concerned with passenger shipping sailing to and from North America, it is a place of bustle and hustle, of constant greetings and farewells. Much merchandise too, arrives and departs from this Hampshire town, and from the docks, some of which are seen in this aerial photograph, all kinds of British-made products are loaded aboard cargo vessels that trade with distant lands.

days there was a Roman walled town on the east bank of the Itchen, but probably after the Danish invasions of the 11th century the present site on the west bank became the important part of the community. The Bar Gate is the most famous spot on the line of the ancient walls. The pride of modern Southampton is the new Civic Centre, including town hall, and art gallery.

The natural harbour is one of the finest in the kingdom, and has the unusual advantage of a double tide. Under a great extension scheme, more than 400 acres of land to the west of the original docks are being reclaimed and added to the available dock and industrial area. In 1933 King George V opened at Southampton the largest dry dock in the world. Since that time the huge floating dock in the harbour has been disused. The population is about 176,000.

South Australia. The greater part of this State, forming the southern central section of the Australian Commonwealth, is waterless desert, but in the north and north-east is the extraordinary "artesian" system of "Lakes" Eyre, Frome, and Torrens, which are almost dried-up salt beds well below sea-level, while in the south-east are fertile grazing lands and the lower reaches of the Murray.

Adelaide (*q v*), the important and picturesque capital of the State, lies between the Gulf of St Vincent and the sea and Mount Lofty (2,234 ft). From the shores of Spencer Gulf, the principal inlet, which is situated further west, can be seen the peaks of the main Flinders Range and the Hummocks. Profitable settlement is only possible over a small proportion of the State, but the farmers of South Australia are proud of the quality and quantity of their crops, while fruit growing and flour milling are on the

Extent—380,000 square miles **Population** (excluding aborigines), 591,000

Physical Features—Featureless desert in north and west. Flinders and other mountain ranges in the east, rising to over 3,000 feet, and surrounded by pastoral lowlands. Lakes Eyre (4,000 sq miles), Torrens, etc., form central drainage system of Australia. Rivers include the Darling.

Principal Products—Wheat, barley, and other crops, fruit, wine, meat, wool, flour, copper, iron, gypsum, dairy produce.

Chief City—Adelaide (capital), 318,000

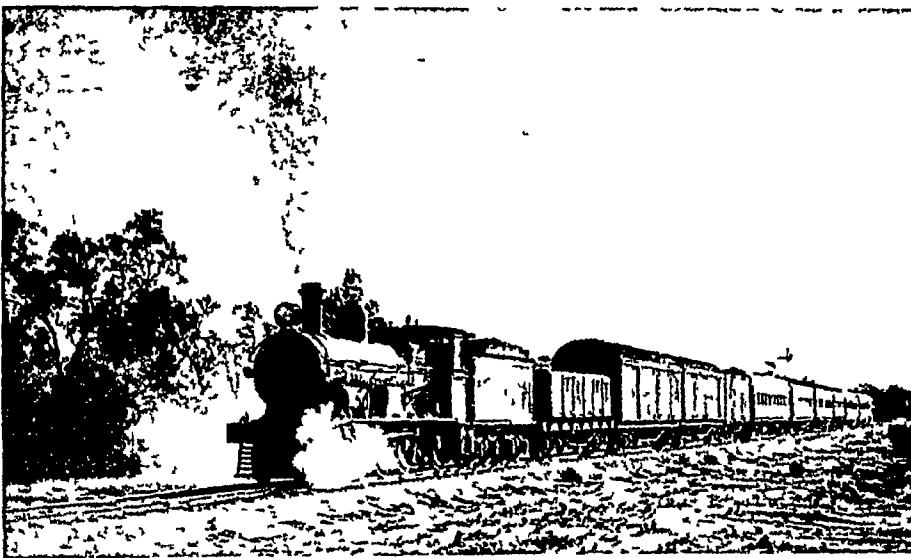
increase. The vineyards in the Adelaide district are famous, and copper and iron are only two of the minerals exported.

South Australia was founded as a British colony in 1836, when Capt Hindmarsh, R.N., the first Governor, landed near the site of Adelaide. Matthew Flinders (1774–1814), the famous explorer and navigator, had surveyed the coast 34 years previously. The desert Northern Territory, occupying that part of the continent to the north of South Australia, was at one time under the control of that State, but it was officially handed over to the Commonwealth Government in 1911. The State has a Parliament of two houses, and is administered by a Governor appointed by the Crown and assisted by an Executive Council.

Railways have done much to solve the transport problems of South Australia. The Transcontinental (East-West) Railway runs westward across the desert to Kalgoorlie (Western Australia) from Port Augusta, on Spencer Gulf, with an extension to near Port Pirie, the second largest town in the State. In addition there is a line running north from Port Augusta to Alice Springs in the Northern Territory.

Southey, ROBERT (1774–1843). To have written some of the finest biographies and some of the most enchanting and self-revealing letters in the English language is no small achievement for any man, even though his great ambition was to win lasting fame as a writer of poetry.

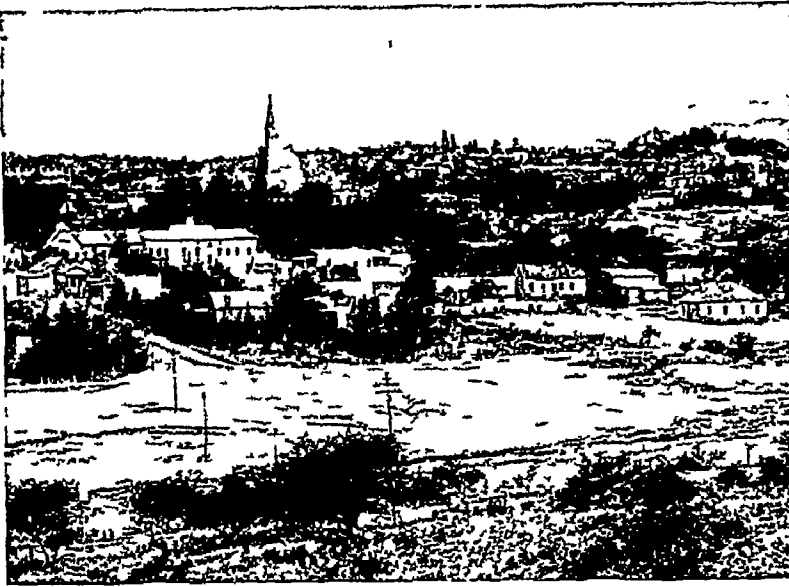
Southey's life of Nelson is regarded as a model of what a short biography should be, and the same is true of his life of Wesley. But of his poems few are now remembered, with



BRIDGING THE DISTANCES IN SOUTH AUSTRALIA

The problem of transport across the Great Victoria Desert, in South Australia, has been solved by the Transcontinental East-West Railway, which runs from Port Augusta across the desert to Kalgoorlie, in Western Australia. Above, the train is seen speeding across the waste lands.

By courtesy of the Australian National Travel Association



CAPITAL OF SOUTH WEST AFRICA

This pleasantly situated town is Windhoek, capital of the mandated territory of South-West Africa. It has hot thermal springs, and is connected by rail with the former German port of Swakopmund on the coast at Walvis Bay. Two-thirds of its population of 20,000 are coloured.

By courtesy of South African Railways

the exception of some of the ballads, such as "The Inchcape Rock" and "Lord William."

Southey was a firm friend of the poet Samuel Taylor Coleridge, with whom he lived for some years. In 1813 he was appointed Poet Laureate **South-West Africa.** This territory, formerly known as German South West Africa, was surrendered by the Germans in 1915, and is now administered by the Union of South Africa under a mandate from the League of Nations. Largely flat and unfertile, it covers an area of about 317,000 square miles, and has a population of some 340,000. The principal occupations are stock-raising and the mining of diamonds.

The capital of S W Africa, Windhoek (population about 20,000), is in the centre of the Territory. Walvis Bay, the chief port, is an integral part of Cape Province in the Union, but is administered by S-W Africa. In 1937, following trouble between the Nazis (National Socialists) and the authorities, restrictions were made on the political activities of German citizens, and the Union Government announced that they would not consider the handing over of the Territory to Germany.

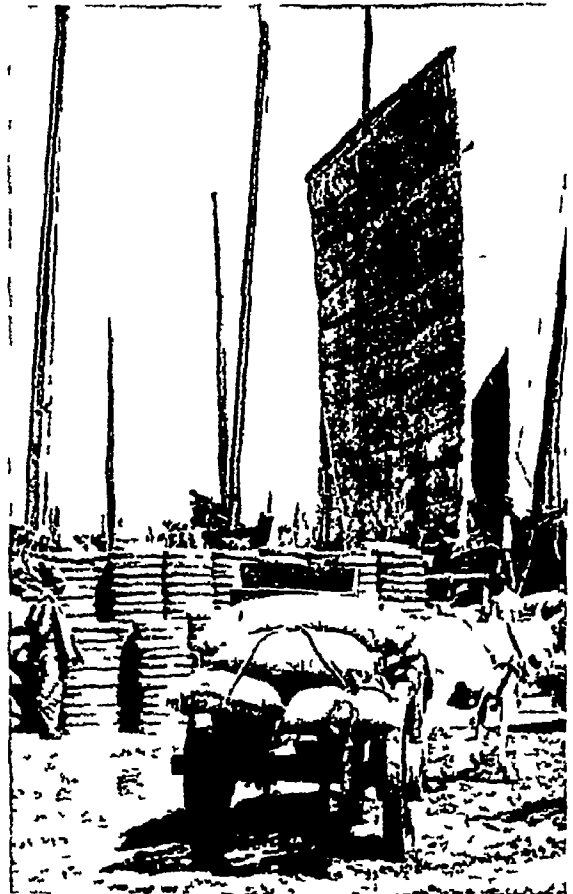
Soya Bean. For building up the soil and at the same time providing a valuable crop for seed or feed, the soya bean (*Soja max*) has become more and more popular in recent years. Like other members of the pea tribe, it can use nitrogen from the air through the action of bacteria on its roots, and thus enrich the soil if it is ploughed in. It is adapted to about the same climatic conditions and soils as maize, and will do better than clover or alfalfa on poor

or acid soils. But although this plant reached England in 1790 and has long been grown in America, it is chiefly a crop of the Far East.

The entire plant is used for hay, silage, or green fodder, and the beans are ground and mixed with other feed. They contain oil, which is used in cooking, soap making, in paint, etc. The "cake" or meal remaining after the oil has been extracted is used extensively as stock feed.

In Asiatic countries, where rice is an important food, the diet is balanced with large quantities of soya bean foods, which furnish enough protein to replace meat.

The soya bean is a bushy upright plant, two to four feet tall, and has branching hairy stems and three parted hairy leaves.



LOADING SOYA BEAN CAKES

What look like grindstones, on the edge of the wharf, are really compressed cakes of soya bean, which is a valuable feeding stuff for cattle. These cakes are being loaded on to junks at Dairen, in Manchukuo.

SUNSHINE *and* SHADOW in SPAIN

A natural and historical link between Europe and North Africa, Spain still bears many traces of six centuries of Moorish occupation It is a land of striking contrasts, in climate, colour, and character

Spain. Nothing strikes the traveller more forcibly than the backwardness of present-day Spain compared with the other nations of Western Europe He will often see a farmer scratching his land with an iron-shod stick for a plough He will notice donkeys bearing loads of firewood twice their size, and lonely charcoal burners' huts, then, as he leans over a brazier in a chilly hotel which ought to have steam heat, he will wonder

why Spain does not use its vast beds of coal Yet in the years immediately preceding the terrible Civil War (which began in 1936) a new Spain had been appearing Jolted out of its sleep of centuries, stripped of almost the last remnants of its once great colonial empire, Spain was improving its roads, its schools, its

Extent—190,050 square miles, with Balearic and Canary Islands, 196,000 square miles Population, about 23,000,000 in 1930 Colonies (in Africa), 128,000 square miles, population, 934,000

Physical Features—Pyrenees and Cantabrian Mountains separating Spain from France, Sierra de Guadarrama, Sierra de Gredos, Sierra de Gata, Montes de Toledo, Sierra Morena, dividing and bounding the central plateau, Sierra Nevada to the south (highest point, Mulahacen, about 11,420 feet) Chief rivers the Ter, Llobregat, Ebro, Guadalquivir, Jucar, and Segura, flowing into the Mediterranean, and the Minho, Douro, Tagus, Guadiana, and Guadalquivir, flowing into the Atlantic Ocean

Products—Wheat, barley, other cereals, cotton, sugar-cane, vegetables, grapes and wine, olives and olive oil, oranges and other fruits, nuts, silk, sheep and goats, wool, other live-stock, sardines, tunny, cod, coal, lead, iron, copper, mercury, silver, salt, cotton and woollen goods, paper, corks, glass, sugar, leather goods, tobacco products

Chief Cities—Barcelona (1,150,000), Madrid (1,014,000), Valencia (352,000), Seville (219,000), Malaga (203,000), Saragossa, Bilbao, Murcia, Granada, Cordoba, Cartagena (more than 100,000)

agricultural methods The revolution of 1931, which established Republican government, gave a new impetus to Spain's progress, but the Civil War has made the task of reconstruction infinitely more difficult

It has been said that Europe ends at the Pyrenees and that there Africa begins Spain, now separated from her colony in Morocco only by the narrow strait of Gibraltar (*qv*), was until late geological

times united with it In its formation as well as in its people the Iberian peninsula suggests the northern coast of Africa Here is the same smooth coast-line, whose indentations, apart from the fiord-like inlets along the Bay of Biscay to the north and round the north-west corner where Spain touches the Atlantic, might almost be numbered on one hand—the bays of Cadiz, Algeciras, Malaga, and the harbours of Barcelona and Cartagena (Spain's principal naval arsenal and dockyard) Spain, too, has a central plain, high, mountainous, and dry, where long mule trains plodding across the waste suggest the Sahara, and there is also the fertile rim studded with flourishing cities

In visiting Spain you will not need to save much of your time for the central table-land, which—rising to an average height of nearly 2,700 feet, and punctuated by toothlike mountain



SPAIN WITH ITS NEIGHBOUR, PORTUGAL

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ranges or sierras—occupies over half the actual area of the land. None of the great cities are there, except Madrid (in normal times the capital), and a few whose interest is chiefly historic. Toledo, the "hundred towered" city, on its rock surrounded on three sides by the "golden" river Tagus, and on the other by medieval fortifications, presents long lines of palaces and convents terraced around the rocky slope, a sheaf of belfries piercing the sky, and the huge cube of the Moorish Alcázar on the topmost crest. Although no longer the capital of a kingdom, as it was under the Visigoths, Toledo is still the church capital and seat of the Primate of all Spain. Saragossa, once the capital of the kingdom of Aragon, is a flourishing modern city. Like Toledo, it has its Gothic cathedral and its Moorish castle, and boasts a university founded in 1474. Salamanca, on the Tormes, is the oldest and most famous of Spain's university towns, and the one which introduced Arabic learning into Europe. Burgos, at the foot of the mountains to the north, is dominated by its Gothic cathedral, the most elaborate in all Spain, and by its romantic memories of that famous Spanish warrior the Cid, who had so many successful encounters with the Mahomedan Moors.

The chief industry of this dreary plateau—we are referring now to

times when Spain is not in the throes of civil war—is represented by the sheep that roam all the summer long in flocks of 10,000 tended by shepherds dressed in sheepskin jackets and leather breeches. Scarcely a tree is to be seen in these regions, for ruthless deforestation, practised through the centuries, has stripped all but six per cent of the land of the great forests that once covered it. Treeless, wind-swept, dusty, exposed to great extremes of cold and heat, this plateau is one of the most thinly populated regions to be found on the Continent of Europe.

But the coast regions of Spain tell a different story. There you will find numerous large cities and active industries. If you cross the Pyrenees from France on the west—there are now railways at both ends—you will come out on the lands bordering the Bay of Biscay, which are the wettest in Europe, just as those on the central plateau are the driest. The air is mild all the year round and roses bloom at Christmas as in midsummer. Here is a scene of active

coal and iron mining. The three Basque provinces alone, nestling at the foot of the Pyrenees, produce annually more than half the iron that is mined in Spain. And they have other active industries—grape growing for wine, apples for cider, and fishing, and if the chief catch of the intrepid Basque fishermen is now the sardines that they find in their "rias" or fiord like inlets, it is only because whales have disappeared from this neighbourhood.

The Basques themselves are a mysterious people, about whose origin scholars have long been speculating. Their racial characteristics distinguish them even when they migrate with other Spaniards or Frenchmen to America, and their language differs from neighbouring tongues not only in its words but in the very type of its grammar. Most students believe that the Basques are a remnant of a pre Indo Germanic race that the Greeks and



SAN SEBASTIAN'S SHORE

On the main railway line from Madrid to Paris, and only eleven miles from the French frontier, lies San Sebastian (above). Until damaged in the Civil War of 1936 it was a much frequented international holiday resort.

Romans found in Spain and called Iberians. The Basques in France and Spain today number about 600,000.

If you cross the Pyrenees at their eastern end, you come upon Barcelona, metropolis of Catalonia, and other densely populated coast towns, where manufacturing, particularly the weaving of cotton, goes busily on. The Balearic Islands (*q v*) are a centre for the manufacture of shoes.

Farther south on this coast lies the great garden region of Spain, centring in Valencia. The climate is hot and dry almost beyond human endurance, but by means of irrigation channels,

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introduced centuries ago by the Moors, the fertile soil is made to yield in tropical luxuriance grains, sugar-cane, oranges, lemons, citrons, figs, dates, pomegranates, tomatoes, melons and grapes. Mulberries, too, grow here in abundance, making Valencia the chief seat of the Spanish silk industry.

The southern provinces of Spain, known as Andalusia, form the beautiful region of which poets sing. Here lies the picturesque Moorish city of Granada, the splendid capital of the Moorish province which held out for 200 years after the Moors had been driven from the rest of Spain. It was once a city of 400,000 inhabitants, but now it is reduced to about one-fourth that size. Its chief glory is the palace of the Alhambra, the most perfect relic of Moorish art. (See Alhambra.) Cordoba, or Cordova, once one of the greatest commercial centres of the world, is still famed for its Cordovan leather and olive oil. Cadiz, said to be the oldest town of continuous

existence in Europe, was founded about 1100 B.C. by the Phoenicians under the name of Gadir. It remained an important city for thousands of years, having its final burst of splendour in the 18th century, when it held the monopoly of trade with Spanish America.

The south of Spain is also the country of famous wines, malaga and sherry (named from Jerez), although wine is to a great extent an industry



SPANISH LIFE BOTH GRAVE AND GAY

Top left, we see an old Spaniard, typical of the peasantry of the country, matured by hardship and toil. The mantilla is seldom worn in the street save during Holy Week, when this charming head-dress of black silk lace (top right) is part of the regulation costume. Dancing is a living art in Spain, particularly in Andalusia, and in Seville it is not unusual to encounter groups, such as that below, dancing merrily to the guitar and castanets.

Photos: top left, R. Gorboid; top right, E. N. A.; bottom, Doreen Leigh.

of all the 49 provinces. Even the central plateau in places is irrigated for grape-growing. In these tropical regions you will everywhere see lizards, sometimes three feet long, and scorpions, and you may walk through stately forests of cork oak, whose bark is one of the chief products of the country.

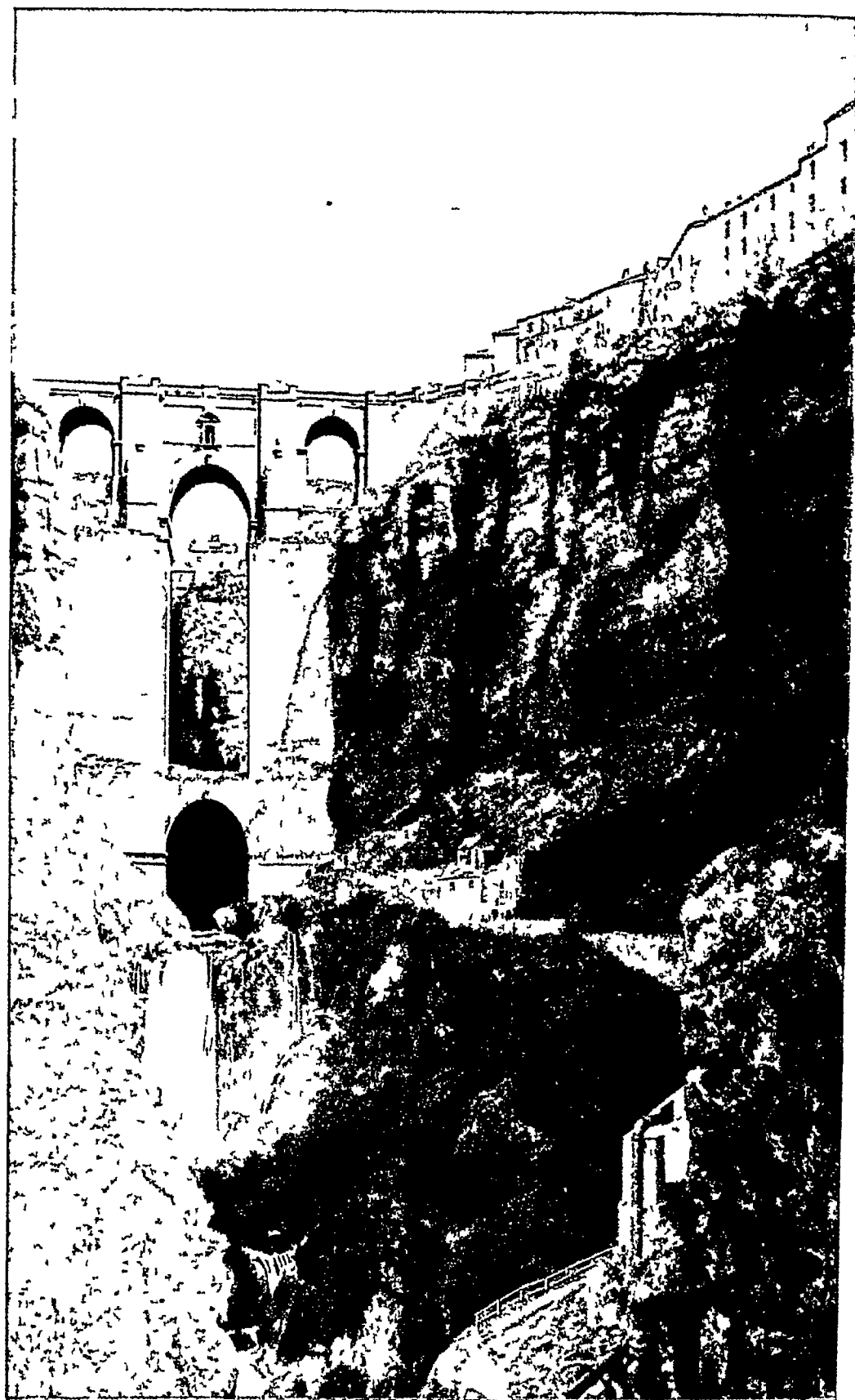
Next to agriculture, mining is the greatest source of Spain's wealth. Its mountains yield an astonishing variety of minerals, including copper, iron, lead, manganese, zinc, antimony, fluorspar, pyrites, and potash. Spain has the world's largest and richest deposits of mercury, and its coal reserves are vast. The bulk of the mineral production is exported to other countries. Coal, however, is not mined in sufficient quantities to



Neville Hardy

A 'CARMEN' OF MODERN SPAIN

Before it became a tragic battlefield Spain was a land where the romance of olden times lingered long and was displayed in many a charming shape at Granada, in particular the spirit of the colourful past was very evident in place and people. In the picture above we see a gypsy girl of this region dancing an old-time measure

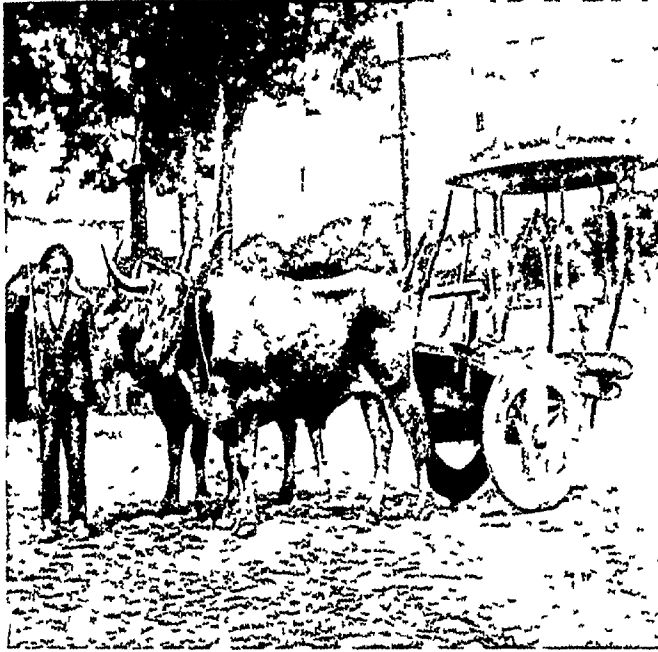


John Bushby

ROCKY GORGE IN ANDALUSIA

Beneath the Tolox and Estepona hills Ronda, seen above, lies on a lofty plateau rent in twain by the awesome chasm of the Guadalevin Andalusia, with its lingering sense of the East and its old cities recalling the Moorish occupation, is plainly different from the rest of Spain

SPAIN



OLD WAYS IN SPANISH TRANSPORT

In some respects Spain is still in a very backward condition compared with other great European countries. Here, in a cobbled street of Corunna, is a bullock-cart of a type still employed all over Spain for drawing heavy loads. But then the Spaniards are seldom in a hurry!

only half as many in habitants. Spain's economic progress has also been greatly retarded by illiteracy. Until a few years ago two thirds of the Spaniards were unable to read, although this proportion is being slowly reduced. Spain has eleven universities—Madrid the largest, Salamanca the oldest, Granada, Seville, Valencia, Santiago, Saragossa, Valladolid, Murcia, Oviedo, and Barcelona.

The pageant of Spain's past is as picturesque and full of contrasts as the country itself. Ten centuries before our era the greatest seamen of the ancient world, the Phoenicians, sought

satisfy the domestic requirements, and there are considerable imports of coal from Great Britain. Water power is being developed. Railways are still too few for the needs of the country, and in the remoter parts ox teams and mule trains are the only means of transport. The leading manufactures are iron and steel, cotton goods, paper, glass, sugar, cork products, and silk.

Spain's industrial backwardness, despite its natural wealth, is due to the character of its surface and its people. The great barrier of the Pyrenees, passable only in a few places, has kept the country from becoming a crossroads of commerce between Africa and the rest of Europe, while its many ranges of east to west interior mountains and its unnavigable streams have isolated its people into sharply differentiated groups, speaking different dialects and languages. It was not until the 16th century that political unification was accomplished, and even today the differences of customs, sentiment, and economic organization are so marked that Spain is a nation regionally divided against itself.

Other factors, too, have handicapped Spain—the rigours of the Inquisition, which stamped out individual initiative, the neglect of trade and industry in the quest of gold in the New World, unwise monetary policies, and the depopulation resulting from long warfare.

Spain today is as thinly populated as Ireland, with twice the area of the British Isles, it has



Dorien Leigh

INTERVAL FOR REFRESHMENTS

Spain is a thirsty country, and the Spaniards are a thirsty people. They believe in the slogan 'Drink more milk' though in their case it is usually goats' milk, and the goat-herd periodically parades his flock through the town. This little Andalusian damsel, at a festival in Seville, finds it an ideal thirst-quencher.

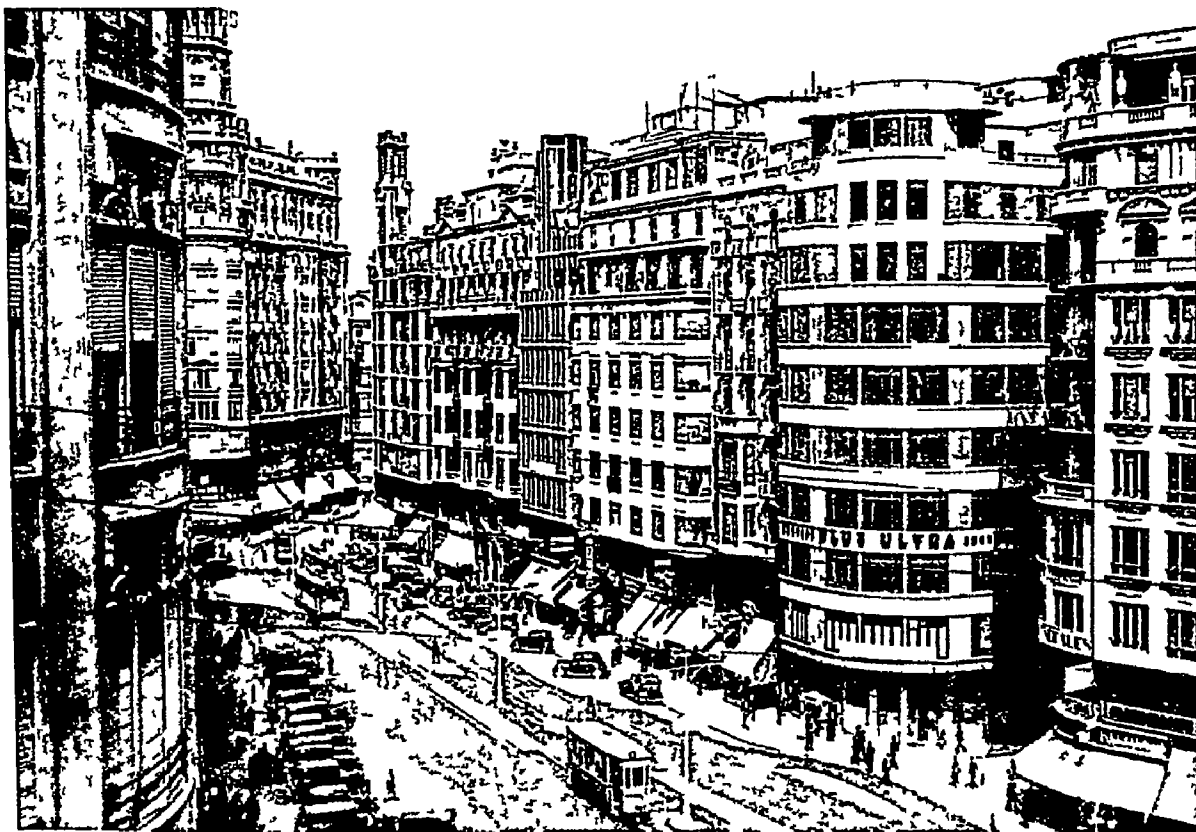
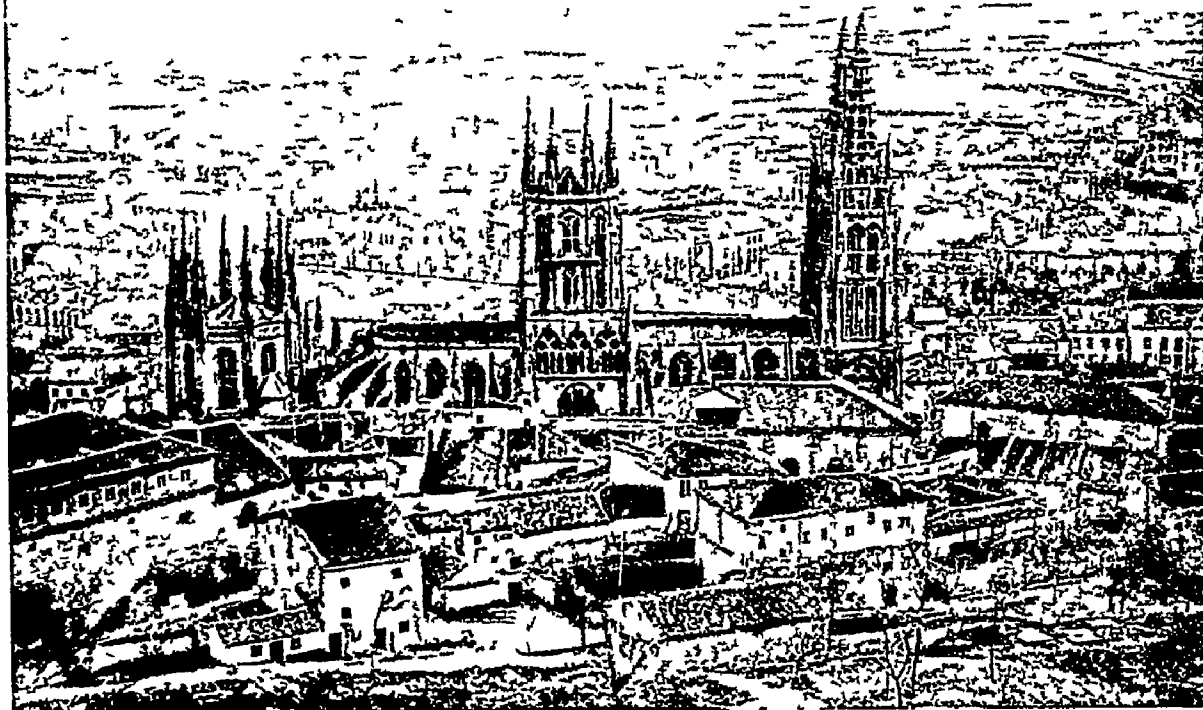
WHERE THE MIDDLE AGES LIVE ON IN SPAIN



Avila (top), on the Adaja, is a splendid example of a medieval wall-girt town, and its granite walls, with 86 towers and nine gateways, are extremely well preserved. Its ancient churches and town houses of the nobility of Castile enhance the medieval atmosphere of this fascinating town. Santiago de Compostela (below) is a sacred shrine of Spanish Christendom, for the great cathedral which you see is built over the supposed remains of the apostle St. James. The city, 32 miles from Corunna, is visited by pilgrims from all parts of the world.

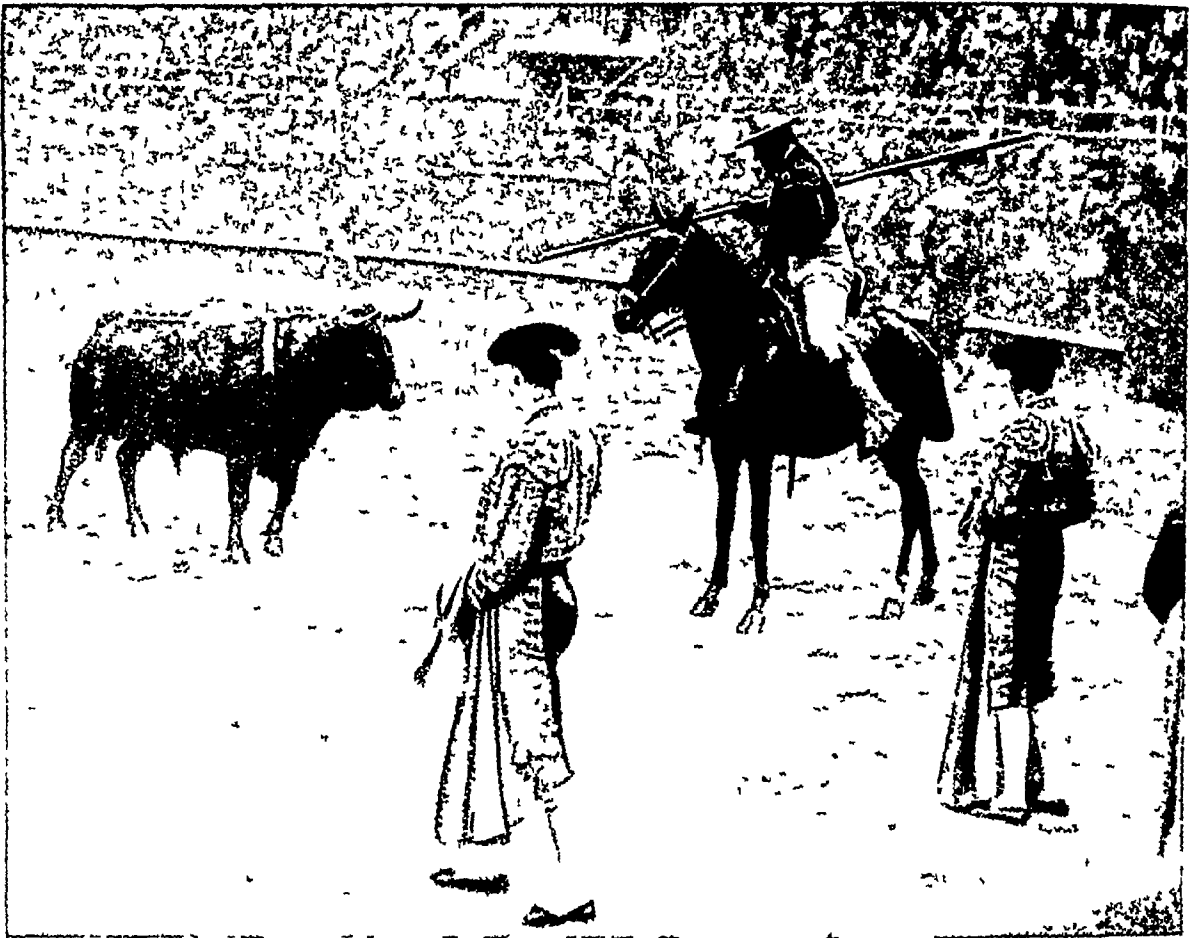
Photos top H. Felton bottom E. A. A.

THE OLD AND THE NEW IN SPANISH CITIES



Burgos (top) lies 230 miles north of Madrid, and owing to its position on a hill nearly 3,000 feet in height, it experiences a severe winter and an unpleasantly hot summer. Capital of Old Castile, Burgos glories in its magnificent 13th-century cathedral seen in the centre of the photograph. Below is a more modern town—Valencia, third largest city of Spain. The fine business thoroughfare you see is the Avenida de Blasco Ibañez, named after the famous novelist. Valencia is an important manufacturing town and seaport, but it suffered severely during the Spanish Civil War in 1938.

Photos top E. R. W. Lincoln bottom E. N. A.



BUTCHERED TO MAKE A SPANISH HOLIDAY

Dorcen Leigh

About 6,000 horses and 1,500 bulls are killed every year in Spanish bull fights. When the bull, already enraged by an iron pin with streamers attached, which is stuck in its shoulder, enters the arena, it at once attacks the mounted "picadores," often disembowelling the horses with its powerful horns. The "picador" is armed with a short-pointed lance, which he thrusts into the bull's back. After the "picadores" have maddened the animal with pain, it is the turn of the "banderilleros," who plant barbed darts into the beast's flanks and neck. Afterwards the kill takes place, an "espada," or "matador," brings the bull into proper position by means of a "muleta," or red silk flag, and then essays to kill it by a single thrust of his sword through the back of its neck. It is a sport unworthy of a great people.

its shores in their tiny ships for non and tin. Five hundred years later Carthage colonized the land and held it until Rome's galleys and armies drove out the Carthaginians in 201 B.C. Then came six centuries of Roman colonization and government. The bull fight, Spain's most popular diversion today, is really a survival from the Roman wild beast shows.

With the 5th century A.D. began 300 years of subjection to barbarian conquerors—the Vandals, who gave their name to Andalusia (Vandalusia), the Suevi, and the Visigoths. The Visigothic period (415–711) ends with the great battle of Jerez de la Frontera (711), in which Moorish invaders from Africa overthrew the Goths and established a Mahomedan power which lasted over seven centuries.

The Moorish period represents a stage in the pageant of Spanish history almost richer than the time of the Romans, and the development that the Moors gave the land has persisted to our own day. They made the arid soil of Spain blossom like the rose, and the old Roman cities, built over again on Arabic lines, began to develop

graceful palaces and vast mosques with domes and minarets. Fine metal work and silk and leather work as beautiful as any from the Orient came out of Spain, and a Toledo sword blade became as desirable as one from Damascus.

Christian kingdoms meantime were formed in the northern mountains and were nibbling bit after bit from the Moorish domains. The kingdom of Asturias on the Bay of Biscay, which later expanded into the kingdom of Leon and Castile, was the cradle of Spanish liberty. Soon Aragon, Navarre, and the county of Barcelona (Catalonia), at the foot of the Pyrenees, and Portugal on the Atlantic, arose to join in the age long battle to free Spain from the infidel. In the battle of the plains of Tolosa (1212) Castile and Leon broke the Moorish power and shut it up in the small Mahomedan kingdom of Granada.

From this period came the great tales of chivalry. Among these are the songs and stories of the brave Christian knight, the Cid (meaning "the lord"—his real name was Rodrigo Ruy Diaz de Bivar), who in the 11th century did so many deeds of prowess.

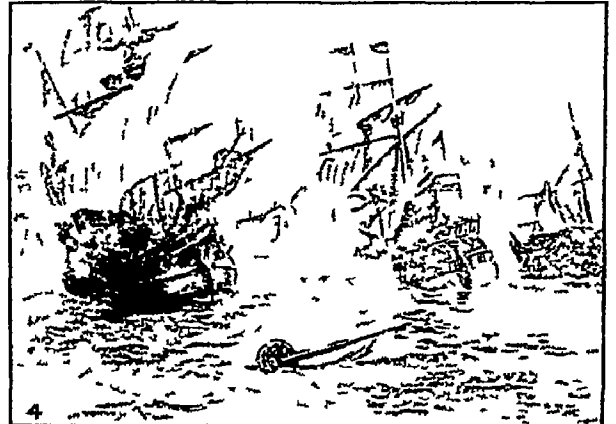
SPAIN

With the marriage in 1469 of Ferdinand of Aragon and Isabella of Castile, most of Spain was united under a single rule. In 1492—the year Columbus gave the New World to the Spanish Crown—came the final expulsion of the Moors from Spain through the conquest of Granada.

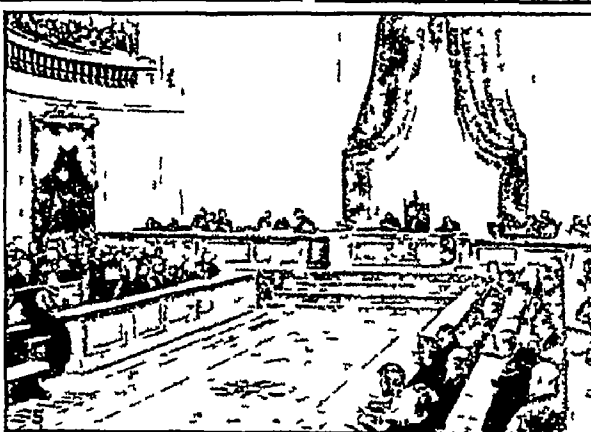
Under the grandson of Ferdinand and Isabella, Charles I of Spain—better known as the Emperor Charles V—Spain became mistress of most of the known world. With his son Philip II, the Inquisition spread its baneful influence over Spain. Moors and Jews were expelled, and Protestants and even Catholic Spaniards were tortured and burned at the stake in terrible bonfires known as the *autos da fe* or acts of faith. Freedom of thought and initiative were crushed

and at the same time the resources of the kingdom were permanently impaired in the vain attempt to suppress Protestantism in other lands. (See Armada, Spanish)

After the time of Philip II Spain steadily declined in power. The War of the Spanish Succession (1701–14) cost it most of its outlying possessions in Europe and seated a French Bourbon prince on its throne. From 1714 to the outbreak of the French Revolution, Spain was little more than a satellite of France. In 1808 Napoleon placed his brother Joseph on the throne of Spain, and the outraged Spaniards revolted. Aided by the British, they freed the country from Bonaparte rule in the Peninsular War (1808–14). At the same time a liberal constitution was adopted (1812), but Ferdinand



After enduring nearly seven and a half centuries, Moorish rule in Spain ended in 1492 with the surrender of Granada to Ferdinand of Aragon (1). As Boabdil, the last Moorish king of Granada, turned to take his last look at the city he burst into tears. "Right my son," tauntingly exclaimed his mother, "weep like a woman for the throne which you had not the spirit to defend as a man and a king!" That same year Columbus set out on the voyage which ended in the discovery of the New World. In the next picture (2) we see him on his return in 1493 showing Ferdinand and Isabella the trophies of his bold expedition. Under Charles V, who ruled Germany, the Netherlands,



and Naples and Sicily as well as Spain, Spanish power reached its height. The third picture shows Pizarro, the conqueror of Peru, winning the approval of Charles for the projects which added enormous conquests to Spain's possessions in the New World. After Charles V Spain's star declined. With the defeat in 1588 of the Great Armada (4) her sea power was broken and the flood of treasure which had been pouring in from the New World gradually ebbed. But the autocracy which had brought Spain so low was ended in 1812, when the Cortes (5) enacted a constitution and a better day rounded on democratic ideals began to dawn.

FIVE DRAMATIC MOMENTS IN SPANISH HISTORY



PRIMO DE RIVERA MAKES A SPEECH

General Miguel Primo de Rivera, the first dictator of Spain, seized supreme power in the country in 1923, introducing a new form of government in 1925, when he became Prime Minister. But he had to resign in 1930, and died the next year.

VII abrogated it when he returned to the throne. By the end of his reign—he died in 1833—Spain had lost all its vast empire in the New World except Cuba and Porto Rico, and these were lost in the Spanish-American War of 1898.

As the old absolutist Spain decayed, a new and more liberal Spain was struggling forward. Conflicts between liberals and reactionaries brought alternate years of revolutionary movements and periods of constitutional government. From 1873 to 1875 Spain was a republic, but in 1875 the Bourbon monarchy was restored. In 1876 a new constitution was adopted. A powerful military organization was saddled upon the people, and Church control was strongly entrenched.

Both Army and Church were staunch supporters of the monarchy.

During the World War Spain remained neutral, but there was widespread unrest. Violent strikes paralysed industry, a separatist movement in Catalonia threatened to disrupt the kingdom, uprisings of the Riff tribesmen in Spanish Morocco seemed likely to drive the Spanish from northern Africa.

General Primo de Rivera, following the example of Mussolini in Italy, seized power in 1923, suspended the constitution, suppressed political parties, and set up a form of dictatorship. With French aid, he put down the Moroccan revolt. He made strikes illegal, helped in founding new industries, built many miles of excellent highways, and attempted other reforms. For a time conditions improved. But renewed world-wide depression after 1929 brought renewed depression to Spain. Primo de Rivera attempted to reform the inefficient Spanish Army, thus losing its support and that of the King. He resigned in 1930.

Opposition to the dictatorship now turned into opposition to the monarchy. Republican parties won an overwhelming victory in the municipal elections of 1931. King Alfonso fled (see Alfonso), and a Provisional Republican Government under President Alcalá Zamora took control.

The young republic faced the problems of modernizing a country which had fallen far behind in the march of progress. Most difficult

were the problems of the farmers. Three-quarters of the Spanish people get their living directly from agriculture. Yet Spanish farming methods have changed little since the Middle Ages.

The almost feudal nature of Spanish land-ownership was a great obstacle to the improvement of farming methods. In the south, huge estates were owned by nobles and great landlords, who lived in Madrid or abroad and took no interest in their land. In the north and north-west, the land was divided into such small holdings that the farmer could not gain a living for his family and was unable to improve his methods. Furthermore, the Spaniard, son of a hot sultry climate, has never been noted either for his energy or for his industry.



LEADER OF THE NATIONALISTS

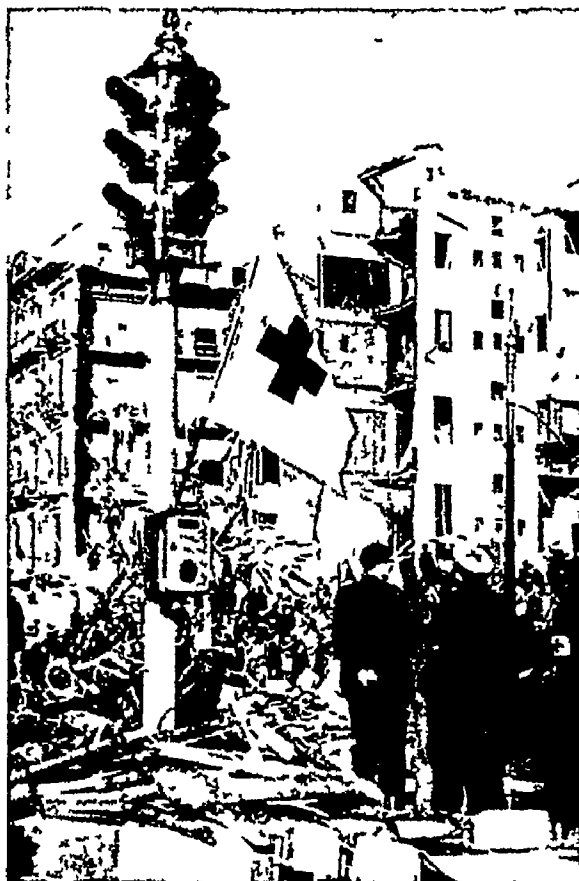
Leader of the army officers who revolted against the Government in 1936, General Franco was installed as "Head of the Spanish State and Government" at Burgos in October of that year. He is here seen acknowledging cheers immediately after the installation.

SPAIN

As its first step in attacking its many difficult problems, the young Republic adopted a new Constitution, drawn up by Spanish "intellectuals" who had studied the governments of other nations. This constitution provided for a single House of Parliament, the *Cortes*, a President elected every six years and subject to removal by the *Cortes*, and a Cabinet under a Premier who was responsible to the *Cortes* and could be removed by it. It gave the vote to everyone over 23, provided for the separation of Church and State, made education for all free and compulsory, and guaranteed freedom of speech, of religion, and of the Press. It renounced war as an instrument of national policy, and it promised to establish government by "workers of all classes."

But dissatisfaction and unrest continued to grow, and two new parties came into prominence, the Fascists led by José Primo de Rivera, nephew of the former dictator, and the Catholic Action party led by José María Gil Robles. When Gil Robles was admitted to the Cabinet, workers in the north feared that he would seize power as Hitler had in Germany, and therefore revolted. Moorish troops brought over from Africa suppressed the revolt with much cruelty, especially against the miners in Asturias. More than 25,000 were imprisoned. Thoroughly alarmed, the Left parties now united into a "Popular Front" and won a sweeping victory in the election of February, 1936.

Before the new Popular Front Cabinet had proceeded far, a military revolt broke out in Morocco and soon spread to the mainland. The revolutionaries were led by Generals Francisco Franco and Emilio Mola. As the



Planet News

BOMBING OF BARCELONA

Among the many horrors of war, bombing from the air is one of the most dreadful for it spares neither women nor children, the aged nor the infirm. Here is a scene in Barcelona after an air raid in 1938 during the Spanish Civil War.

war progressed, extremists took control on both sides. Conservatives joined the Fascist rebels, although they disapproved of many of the

Fascist principles, and Liberals supported the new war Cabinet headed by the Socialist leader, Francisco Largo Caballero. Bravery and cruelty were exhibited on both sides as the terrors of civil war took a frightful toll of life, destroyed enormous quantities of property, and aroused hatreds which would embitter the land for years to come. Thus, while the civil war solved none of Spain's underlying problems and made more difficult the ultimate solution, it split the country into two armed camps, one tending towards Fascism, the other towards Socialism or Communism.

Rebel or "Nationalist" troops under Franco found their first foothold at Spain's



Wide World Photos

WHEN BROTHER KILLS BROTHER

Wars between different nations are terrible enough, but those waged between people of the same nation, like the Civil War in Spain, seem much worse. Above, General Franco's troops are seen entering the town of Lerida at the beginning of April, 1938, and wounded men are lying in the roadway, shot by their fellow countrymen.



DRIVEN BY WAR FROM THEIR NATIVE LAND

The persistent drive of General Franco's troops in the spring of 1938 eastward into Catalonia along the French border drove hundreds of Government-supporters into exile. They endured unspeakable hardships, trekking over the snow-covered Pyrenees, some with children astride their shoulders, until they found a temporary haven on the soil of France.

southern tip, to which they ferried native Moorish troops and army supplies across the Strait of Gibraltar from Morocco. A second rebel army under General Mola (later killed in an air crash) was formed around Pamplona and Saragossa in the north. Day by day these two armies fought their way across Spain towards Madrid, cutting off the city's rail and highway communication with the coast as they approached. A line of communication between Franco's and Mola's armies was opened in August and the convergence on Madrid hastened.

Franco's forces rescued a rebel army garrison besieged in the ancient Alcazar fortress in Toledo, and then pressed on, reaching the outskirts of Madrid early in November. The government moved to Valencia, and, later in 1937, to Barcelona, leaving the city's defence to the untrained militia, which maintained a stubborn resistance. Rebel leaders set up headquarters in Burgos and claimed that Franco was the head of the legitimate government of Spain. This claim was speedily recognized by the governments of Portugal, Germany, and Italy.

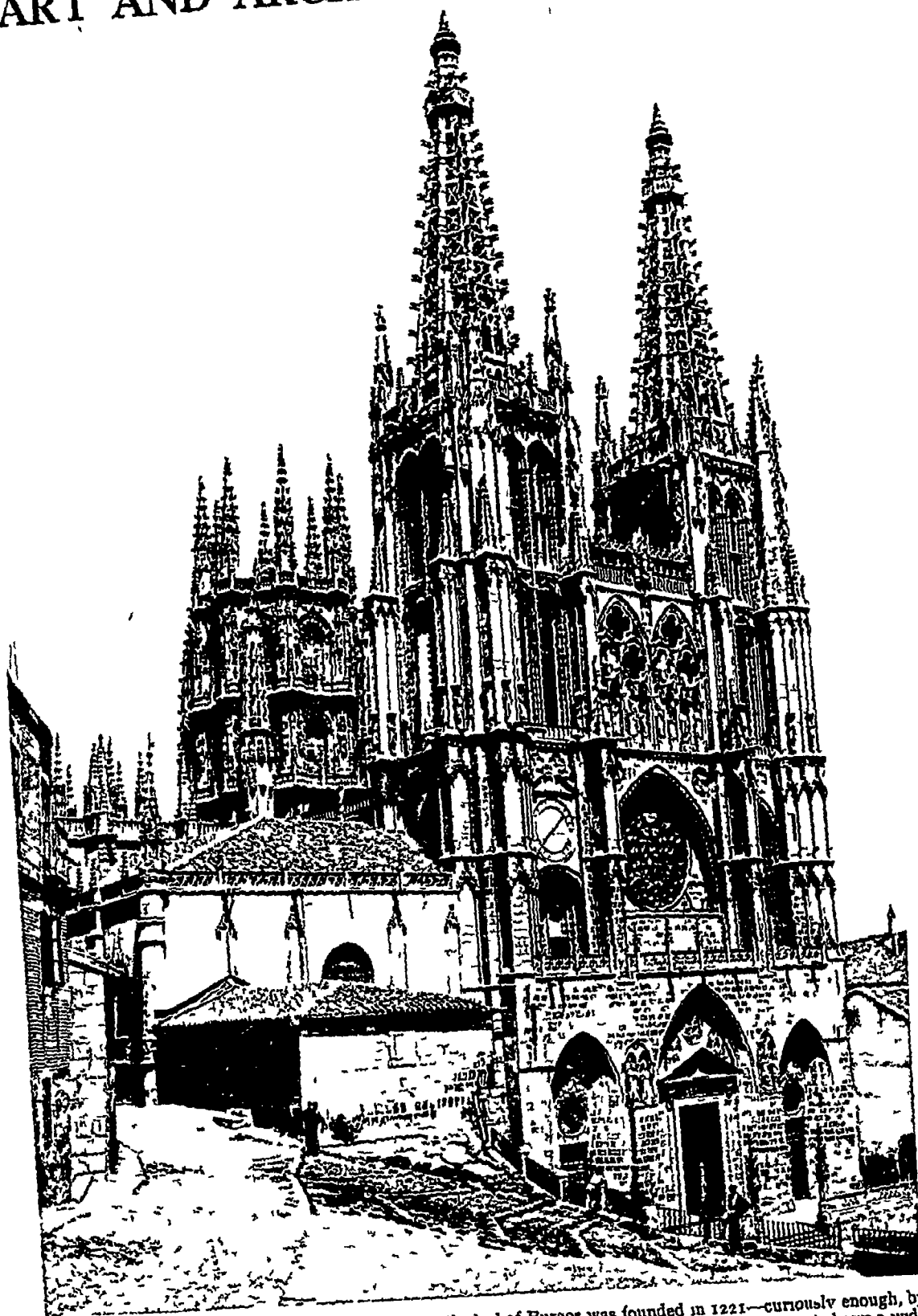
These Fascist nations had supported Franco from the first, because of their sympathy for his political aims, their fear that his defeat would mean a victory for Communism, and their belief that a Spanish government sympathetic to them would prove strategically important in case of a general European war.

They sent arms, ammunition, bombing planes, and trained "volunteers" to aid the rebel cause. Soviet Russia, on the other hand, aided the loyalist side by sending munitions and helping to organize within Spain an "International Brigade" of anti-Fascist volunteers from many lands. Such foreign participation made of the Spanish struggle a miniature world war, and further embittered the siege of Madrid, which was marked by repeated bombing raids and extreme cruelty on both sides.

In the spring of 1938 the balance turned in General Franco's favour, for in spite of the grim resistance and occasional successes of the Government troops the Nationalists succeeded in isolating Catalonia and cutting off communications with Madrid.

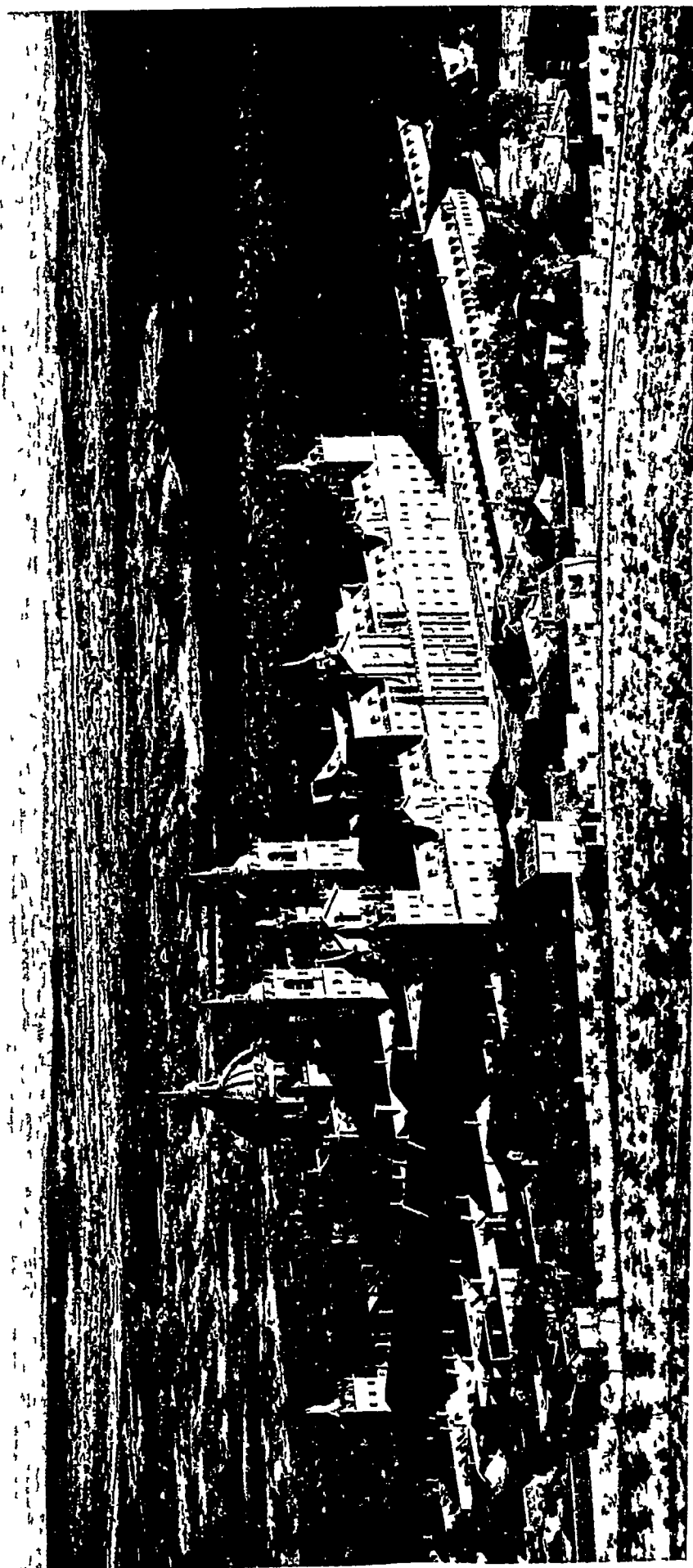
The Civil War dragged on, however, with undiminished ferocity, until early in 1939, when the eventual victory of General Franco was foreshadowed by his capture of Barcelona and the rest of Catalonia. At the end of February the British and French Governments recognized Franco's government as the official rulers of Spain. Madrid fell to Franco's forces in March and the war was over. Spain declared her neutrality in the European war that began in September, but in June 1940 declared herself a "non-belligerent," thus expressing her willingness to give every possible assistance to a chosen belligerent short of active participation.

ART AND ARCHITECTURE OF SPAIN



Perhaps the finest Gothic structure in Spain the cathedral of Burgos was founded in 1221—curiously enough, by an Englishman—but it was not completed until some three hundred years later. In consequence it shows a wide range of Gothic styles. In this picture the earlier work is visible in the lower half of the building while the great spires and pinnacles show the influence of a German architect who was responsible for the 15th-century parts. This ornateness largely spoils the fine effect of the façade, designed two hundred years earlier.

Photo by F. Mansell

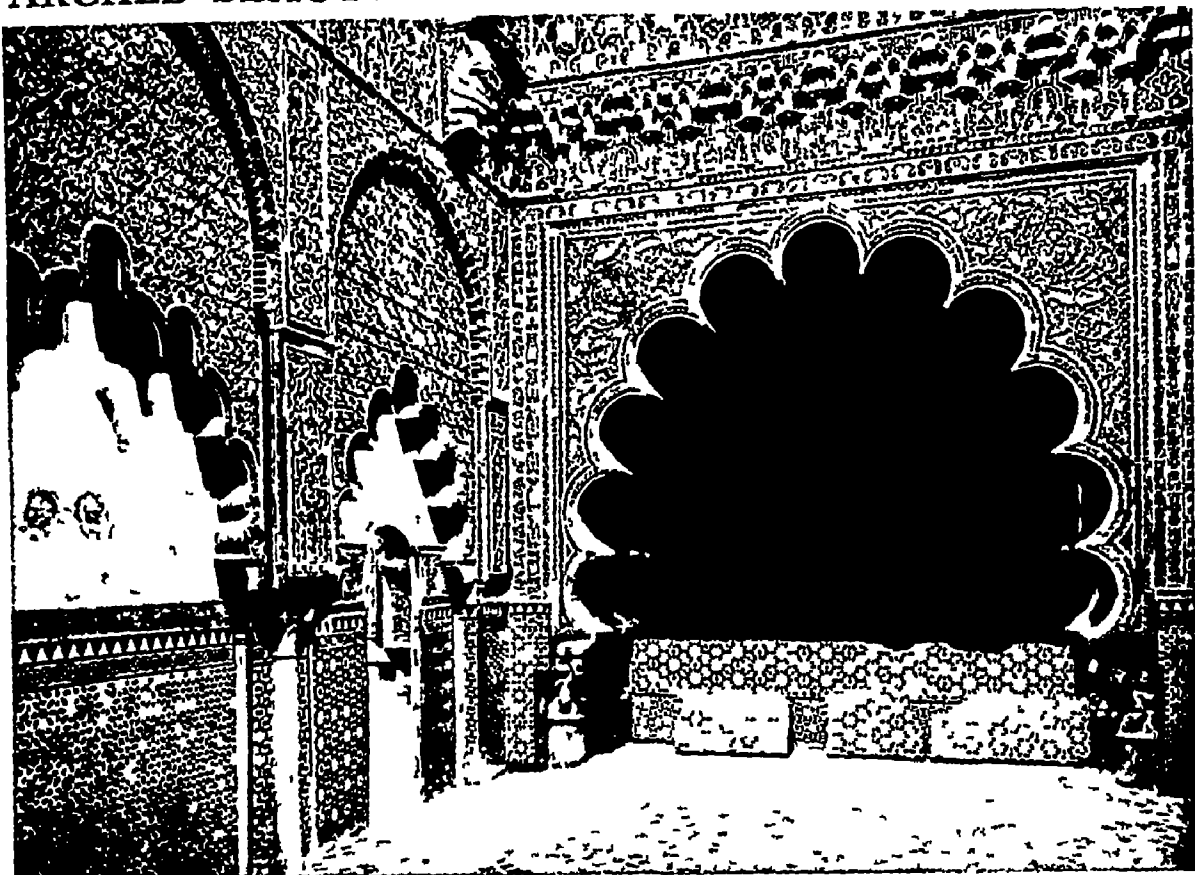


THE ESCORIAL—VAST PILE OF ROYAL AND RELIGIOUS BUILDINGS

Built by Juan Herrera to the order of Philip II, this huge building—for it may be considered as a single whole, so unified is its vast design—dates from the middle of the 16th century. It contains a vast cathedral church, a royal palace and apartments, library and picture-gallery, and a monastery with its college attached. Yet it is none the less a compact, well-knit structure, perhaps a little grim in general appearance but a change indeed from the ornateness of the German-Gothic manner of Burgos (overleaf) or the wonderful intricacy of the Moorish buildings of Cordoba (opposite page). The Escorial is said to contain over 2,500 windows, 1,200 doors and about 90 fountains. It is situated on rising ground some 34 miles north-west of Madrid and commands a magnificent stretch of country.

Photo Anderson

ARCHED BEAUTY IN CORDOBA'S MOORISH MOSQUE



One of the finest Moorish monuments of Spain is the great mosque at Cordoba and here is a general view of the hypostyle with its amazing red and white columns and arches. Originally there were 1 420 of these but a number have disappeared. There is a good deal of superb ornament in other parts of the mosque, such as the glorious example seen in the upper photograph. For sheer intricacy of design this can hardly be matched, and it has a beauty totally different from anything ever produced by European artists.

Photos Anderson

WEIRD BRILLIANCE OF EL GRECO'S DESIGN



One of three fine El Greco paintings preserved for many years at Toledo, this "Burial of Count Orgaz" shows that artist's style to perfection. With a curious tortured sense of rhythm he combines an extraordinary skill in the use of brilliant light and shade and a most original range of colours. Here, the realism of the human scene is strangely matched by and cunningly linked with the Divine one, notice the use of the torch-flames and the Cross to hold the two parts of the picture together.

Photo Anderson

VELAZQUEZ AT HIS BEST IN HIS LAST PERIOD



Like other very great painters Velazquez in his last period was able to produce the most brilliant effects with the minimum of effort and this famous painting, *Las Meninas* (the dwarfs) is a fine example of this manner. For the unaffected grace of the figures—those of the Infanta Margarita and her ladies—as well as for the particularly pleasant self-portrait this has long been a favourite example of the work of the greatest of all Spanish artists. One of his last important works it is among the treasures of the Prado Gallery in Madrid.

Photo Anderson

A MONTANES MASTERPIECE CARVED FROM WOOD



Almost the only sculptor who could achieve in wood the effects usually sought in stone Montanes must be ranked as one of Spain's greatest artists. Indeed, it is hard, when one considers the quality of most wood-carvings of any size, to realize that this glorious "St John" is in that medium at all. No wonder that the artist was referred to by his contemporaries simply as "the great carver", yet when it came to colouring his masterpieces, he was not too proud to rely on the skill of other artists of his day. This great work is in the Museum at Seville.

Photo Anderson

WINTER & SUMMER FROM THE BRUSH OF GOYA



Often called brutal and "coarse," Goya was by no means always a painter of unpleasant things of life as the lower of these two paintings shows. Entitled 'The Parasol' it has in it much of the feeling one associates with the work of French 18th-century painting and none of the grim mysticism so typical of Spanish art. The snow scene above is nearer to the Spanish tradition and gives an almost uncannily real effect of bitter cold. Notice the use in each picture, of a wind-blown tree to add movement to the scene.

Photo Anderson



SUPERB MODERN SPANISH PAINTING

One of the greatest modern Spanish painters is Ignacio Zuloaga, of whose work this study is an example. Although it shows the influence of the French schools of the late 19th century it is unmistakably Spanish, both in subject and in atmosphere, and, indeed Zuloaga has been hailed as the reviver of truly national Spanish painting. Brilliantly portrayed against a typical landscape of their homeland these three ladies are as essentially Spanish as is their costume.

Zuramer Collection

SPANISH ART

SPAIN'S *Great* LEGACY of BEAUTY

Many styles of past ages are to be observed in the art and architecture of Spain, from the highly-ornamented palaces of the Moors to the grotesques of Goya and the haunting beauties of El Greco

Spanish Art and Architecture.

First the Romans, then the Visigoths, then the Moors, conquered and left their mark in Spain,



Murillo's 'Peasant Boy'
National Gallery photo Mansell

so that it is comparatively late in history that this harassed land had any artistic and architectural style of its own. The Moors left a most lasting impression, especially in the centre and south. Among the innumerable fine examples of Moorish art are the great mosque of Cordoba, with its hundreds of interlacing, superimposed arches, the Alcazar or Palace at Seville, and

the world-famous Alhambra (qv) of Granada, a large series of buildings of which the most exquisite is the Court of the Lions. Much of this Moorish work is, to our eyes, rather over-ornamented and strange, but it is none the less very beautiful indeed.

As the Moors were driven out of Spain, the Romanesque style began to filter in from the north, where it was pure, to the centre and south, where it was often grafted upon Moorish foundations. The first large Romanesque building was the great cathedral of Spain's patron saint, St Iago (James) de Compostela, in the town of that name (Santiago). This style spread until the 12th century, and then the various styles of Gothic art appeared gradually throughout Spain, following much the same sequence as elsewhere in Europe, though being more and more modified by existing Moorish works as they reached the south of the peninsula. (See Architecture)

By the time the 13th century was reached, Gothic was the prevalent style in all but the south of the country. Moreover, Gothic lasted longer in Spain than elsewhere on account of the comparative remoteness of the country from outside influences. Finally, however, the influence of the Renaissance began to be felt, producing architecture of various types, there were, e.g., the *plateresque*, in which the chief feature was a tremendous wealth of extraneous sculptural decoration, the *herrer*a, named after Juan Herrera (c 1530-1597), who built the Escorial near Madrid—a grand yet severe and simple style, and finally, the *churrigueresque* style, named after José Churriguera (d 1725)—

a highly exaggerated form of the baroque style of Italy and central Europe. The finest examples of these several styles are to be seen in the great cathedrals of Spain—in which, indeed, the whole history of the country's architecture can be traced.

Whereas the earliest native Spanish sculptures were quite crude compared with those of other lands, as Gothic styles came in the Gothic sculpture of France came with them. But the artists were for the most part foreigners—German, French, or Italian. The last brought with them the ideas of the Renaissance, and were responsible for the *plateresque* style referred to above. One Spaniard who became eminent as a worker in the manner of Michelangelo was Alonzo Berruguete (d 1561). Spanish sculptors however, practised wood carving on a very large scale for their great cathedrals, two masters in this art being Gaspar Becerra (1520-1570) and Gregorio Hernandez (c 1576-1636). Neither of these, however, are so outstanding



RELIGIOUS PAINTING BY ZURBARAN

There is something stark and oppressive about this fine painting which is typical of Spanish art, almost all of which shows the Spaniard's religious fervour. But in this particular painting of 'Jesus crowning St James' it is relieved slightly by the loving detail with which the flowers have been painted.

Seville Museum photo Anderson



ONE OF THE FINEST PRODUCTS OF VELAZQUEZ' ART

Few subject pictures have ever been so successfully wrought as this famous Velazquez masterpiece, which depicts the surrender of Breda to Spain by Maurice of Nassau in 1625. On account of the forest of those weapons which heightens the warlike atmosphere of this work it is also known as "The Lances." Observe how every part of the picture contributes to a triumphant whole, while the expression of every face has been rendered with the exactness of an individual portrait.

Prado Madrid photo Anderson

as Martinez Montanes (d 1649), "the great carver," whose fine figure sculptures, such as the "Christ" of Seville, are veritable masterpieces. Many of these wood carvings were painted by Francisco Pacheco (1571-1654), who thus linked this art with that of painting, for he was also the teacher of Velazquez.

Painting in Spain was at first under the influence of Byzantine art, as the extant Spanish "primitives" show, though there was, too, the inevitable Moorish influence. Later, Flemish, French and German influences were predominant, especially after the visit of Jan Van Eyck in 1428. Italian influence came in with one Sarnina (b 1354) and became ever more important, Michelangelo and Raphael being the artists especially attractive to Spanish painters. Among these, the chief were Luis de Morales (1509-1568), Luis de Vargas (1502-1568), and various members of the school of Valencia, of whom Francisco Ribalta (1551-1628) is an

important example. All of these painted religious pictures, and, indeed, the strange religious fanaticism which is so characteristic of Spain, together with the Spaniard's frequently morbid outlook, is a governing factor in all this country's art. A Spaniard who worked chiefly in England is Antonis Mor (*see English Art*), whereas a Greek who worked in Spain was Domenicos Theotocopoulos (c 1544-1614), world-famous under his nickname, "El Greco." Working at first in Venice and absorbing much that was finest in the school of that city, he later evolved that strange manner for which he is best known, and which is well shown by the fine "Agony in the Garden" in our National Gallery.

It was in the 17th century that Spain produced her three great painters, in all of whose works may be seen some of that sombre colour, that depth of shade and brilliantly contrasted light, and that intensity of feeling which characterize Spanish painting.

The first of the trio was Francisco Zurbaran (1598-1664), who worked a good deal at Seville, and who was painter to King Philip IV. Above all things a realist, he was consequently apt to make his figures coarse and unimaginative, especially when he incorporated peasants and urban types in his religious paintings. He was influenced to a considerable extent by contemporary Italians, such as Caravaggio and Guercino, and by his countryman José de Ribera (1588-1652), who was also known as *Lo Spagnoletto*. The latter, despite his nationality, was, as a painter, more Italian than Spanish.

Second in time but greatest of Spain's great painters was Velazquez (*q v*). Ranking indeed as one of the greatest artists of all time, he was pre-eminent alike as portraitist, landscape painter, and painter of groups and historic scenes. He did but few religious paintings, and even in them he used as his models the men and women of his own time. Yet to this realism he brought an imagination, a colouring, and a genius for design that have never been surpassed. His *Venus*—the "*Rokeby Venus*"—in the National Gallery in London is considered to be one of the world's most beautiful paintings, while his portrait of Philip IV on a prancing charger, his group "*Las Meninas*" (The Dwarfs), and some of his historical pieces are world-famous masterpieces. He spent much time in Italy, studying Michelangelo, Raphael, and Tintoretto especially, but his own genius was enough to surmount any one influence.

Last of the great Spanish trio is Esteban Murillo (1617-1682), one of the world's greatest religious painters, who, apart from some delightful studies of urchins and peasants, was concerned above all things with the reproduction



ALHAMBRA DETAILS

Much of the decoration of the Alhambra, that triumph of Arab art in an alien land, is in stucco, and here is some of the amazing detailed work in that medium in the Court of the Lions. Such florid ornament is contrary to modern ideas, but we can admire it as a classic example of a former style.

in paint of the lives of the saints and martyrs. Where Zurbaran and Velazquez painted reality, Murillo tried to show idealized types, raised above the spiritual levels of mere humanity by their religious experience. (See also Murillo, Esteban.) Like Velazquez, he left a number of imitators, some of whose works can scarcely be distinguished from his own. At Madrid, however, a strong independent school continued, its chief artist being Claudio Coello (1630-1693), by many considered the last great Spanish painter. This does not allow for Goya (1746-1828), another solitary genius who is now chiefly famous for his superb portraits, his bitter satire, and his nudes such as the famous "*Maja*." As an etcher he ranks amongst the world's greatest, though here again his bitterness and coarse brutality makes his work unpalatable to many.

After him came few truly Spanish painters of international repute, except perhaps Sorolla, a fine exponent of impressionism. Pablo Picasso



STRANGE MODERNISM OF BARCELONA'S BUILDINGS

In Barcelona the spirit of Catalan independence is a very living thing and it is not surprising to find attempts to express it in the architecture of the city. A case in point is this curious building—a block of flats—which is supposed to epitomize architecturally the waves of the sea—the element to which the city owes much of its prosperity.

(q v), by birth a Spaniard and the most influential painter of the 20th century, is considered under French Art, for it is to the main stream of art, emanating from Paris, that he really belongs.

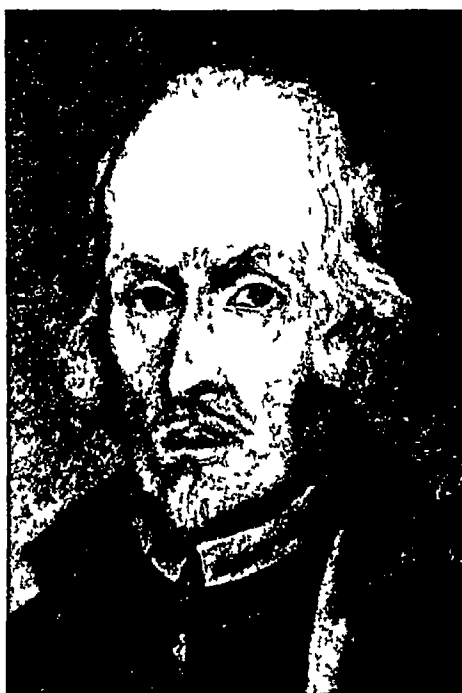
Returning for a moment to architecture, mention must be made of the weird buildings in Barcelona, by Antonio Gaudí (b 1852), in which the architect has tried to express the traditional Catalan independence in a strange, often incomprehensible, fashion of naturalism in building.

Spanish Literature.

The Romans gave the Spaniard his language, but it was the Iberians, Jews, Celts, Vandals, Visigoths, and Arabs, as well, who gave him his character. It is this character—proud, dignified, mystic, gracious, elegant, and sometimes cruel—together with the isolation and wars of Spain, which have etched the traits of Spanish literature. The language, an outgrowth of Latin, resulted in a less uniform speech in this divided country than its sister tongues, French and Italian. The literary tongue is Castilian, a dialect softened by Arabic. Catalonia has a language and a literature of its own.

The earliest known work in Spanish is "El Cantar de Mio Cid" ("Poem of Cid") by an unknown author and dating from 1140. The "Cid" (hero) was Rodrigo Ruy Diaz de Bivar, who died in 1099. Though he had often helped Moslems against Christians, the poem presents him as a dauntless champion of Christianity against the Moors, and leaves a graphic record of the life of the times. Many are the early religious and miracle plays called "autos," such as the "El Auto de los reyes magos" ("Mystery of the Magian Kings"), a play of the Three Wise Men.

Spanish energies were sapped by eight centuries of struggle with the Moors, and



FAMOUS SPANISH DRAMATIST

Don Pedro Calderon de la Barca (above), 1601-1683, was a prolific playwright, but when he entered the Church and became a canon of Toledo he confined himself to works of a sacred character. As a Spanish dramatist he is ranked second only to Lope de Vega.

The language, an outgrowth of Latin, resulted in a less uniform speech in this divided country than its sister

Four great dramatists appear in this same period. The two most famous are Lope Félix de Vega Carpio and Pedro Calderón de la Barca,



RAMÓN PÉREZ DE AYALA

Born in 1881, Señor de Ayala is one of the outstanding writers of modern Spain, and some of his books have been translated into English. One of his most popular novels is "Belarmino y Apolonio," the story of two cobblers, one with an artistic and the other with a philosophic ideal.

the year 1492, when the Moors were expelled, saw the discovery of America, opening new outlets and interests to Spain. The 17th century was the "golden age" of Spanish literature as it was of national glory.

In 1605 appeared the first part of "Don Quixote," bringing fame to poverty-stricken Miguel de Cervantes Saavedra. (See Cervantes) Satire though it is, its most notable result was to project kindness and human warmth into literature, and its influence was felt all over Europe. Two other attacks on hollow chivalry were made in Mateo Alemán's novels, "Guzmán de Alfarache," and "Atalaya de la vida humana" ("The Watchtower of Human Life"), the first of that purely Spanish invention, picaresque literature, dealing with the "picaro," or rogue.

Four great dramatists appear in this same period. The two most famous are Lope Félix de Vega Carpio and Pedro Calderón de la Barca, better known as Lope de Vega and Calderon. The prolific Lope wrote his first play at the age of 12, and tossed off altogether over 1,000 plays. His rapid improvisations lack finish but glow with genius. Cervantes called him "a monster of naturalness." All was grist to his mill, probably no dramatist drew inspiration from so many sources.

Calderón, on the other hand, might be called "a monster of ingenuity." He is at his best in "cloak-and-sword" plays, such as "La Dama duende" and "Mañanas de abril y mayo." His one great philosophical drama, "La Vida es sueño" ("Life is a Dream"), retells an Oriental story, "The Awakened Sleeper." The third of the great dramatists, Gabriel Téllez, called Tirso de Molina, gained fame by dramatizing the old Don Juan legend in "El Burlador de Sevilla y

convidado de piedra" The fourth dramatist is Juan Ruiz de Alarcón, a Mexican hunchback student of Salamanca, and rich business man Mocked for his deformity, he rebuked cruelty and other vices by presenting character types

An outstanding novelist of the 19th century is Benito Pérez Galdós, who wrote a brilliant series of historical novels Pedro Antonio de Alarcón set the world laughing with his "El Sombrero de tres picos" ("The Three Cornered Hat") José María de Pereda hated cities and the middle class, and created fine peasant types

First Spanish writer to win the Nobel Prize was José Echegaray, whose play, "El gran Galeoto," had a great success in Europe and America Modernism in writing was brought to Spain by a Nicaraguan poet, Rubén Darío, famous overnight for his stories, etc., "Azul"

Gamivet and Costa started the movement of "the generation of 1898," resulting in a new flowering of literature Ramón Pérez de Ayala has been called greatest of modern Spanish poets, with sensitive, melancholy Juan Ramón Jiménez perhaps second among them King of the Spanish drama is Jacinto Benavente, winner of the Nobel Prize in 1922 His tragedy of peasant life, "La Malquerida" ("The Passion Flower"), was a tremendous success Delightful comedies were written by Serafín and Joaquín Álvarez Quintero, and delicate, poetic novels and plays by Gregorio Martínez Sierra and María de la O Lejárraga, his wife

Famous abroad for his novel, "Los cuatro jinetes del Apocalipsis" ("The Four Horsemen of the Apocalypse"), Vicente Blasco Ibáñez nevertheless attained but a low literary standard Pío Baroja poured out novels in a forceful, formless cataract, and Ramon Maria del Valle Inclán was a powerful, startling stylist Another stylist, leading critic of Spain, was José Martínez Ruiz, called Azorín, who showed equal skill as poet and novelist

The greatest intellectual force in Spain in recent years was Miguel de Unamuno, philosopher, poet, and novelist, a former exile Individualism was strong in his most famous work,

"The Tragic Sentiment of Life," just as it has always been a vital trait of the Spaniards and their literature The conflict between faith and reason, the essence of Unamuno's work, is at the root of Spanish philosophy (For the literature of Spanish South America, see South American Literature)

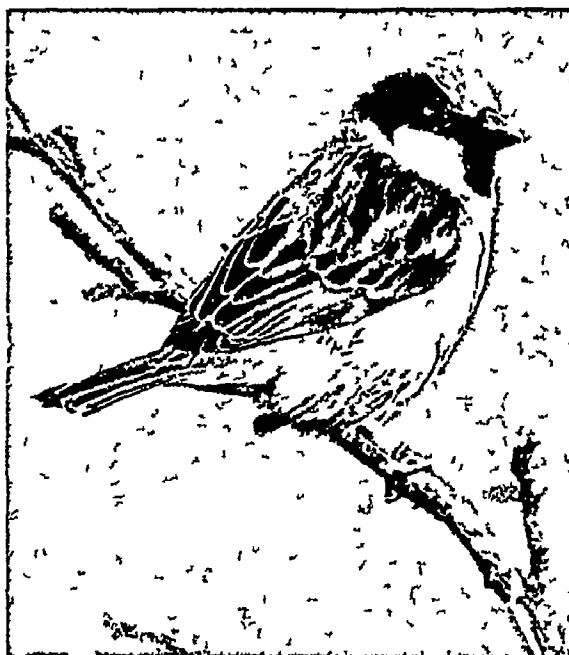
Sparrow. In towns at least everybody welcomes the house sparrow (*Passer domesticus*), whose appearance and habits are too familiar to need description, but in the country it is often more a pest than a pet This little brown bird occurs in almost every region where Man dwells

The tree sparrow (*P. montanus*) is smaller than its better-known cousin, and is a shy bird, shunning the haunts of men It is more elegantly built and has a more musical note Both species lay rather long, thickly speckled eggs, but while the tree sparrow builds its nest in a hole in a tree, the house sparrow often makes a nest in masonry or bush, an untidy mass of straw with a hole in the side It rears many broods each season, eggs having been found in every month

The so called hedge sparrow, or *accantor*, is not related to these birds, for it belongs to its own little group in the finch family It lays bright blue eggs in a neat, open nest, and is one of the cuckoo's favourite victims

Sparta, GREECE
The great rival of Athens in ancient Greece was Sparta, whose vigorous race of iron hearted warriors has given us the adjective "spartan" More like a group of straggling villages than a city, Sparta prided itself, not like Athens on art or learning or splendid buildings, but on its valiant men Although Athens, with her beautiful temples and statues, her poetry and philosophy, dominated the intellectual life of the world, it was Sparta which in the end snatched from its cultured opponent political supremacy

The Spartan government was founded on the "Fascist" principle that the life of every individual from the moment of birth belongs absolutely to the state The elders of the city inspected the new-born infants and ordered the weak and unhealthy to be carried to a near by



THE PERT LITTLE SPARROW

Although he is hardly a favourite in agricultural districts, the house sparrow is the most popular of all birds in the cities, where his cheery voice and (cheeky) ways endear him to those who never see the country sun This individual is a country-bred bird, for no sooty sparrow "townee" has such bright plumage

SPARTA

chasm and left to die. By this practice Sparta made sure that only those who were physically fit should survive.

The children who were allowed to live were brought up under a rule of iron severity. At the age of seven Spartan boys were removed from the control of their parents and organized into small bands, over which the strongest and most courageous were made captains. They slept in public dormitories upon hard beds of rushes, ate coarse and meagre fare, and wore only the simplest and scantiest clothing. They were drilled each day in gymnastic and military exercises, until their muscles were like iron and their will-power like steel. They were taught to endure pain and hardship without complaint, and to obey orders without question.

They were allowed to feel the pinch of hunger and encouraged to supplement their fare by pilfering food for themselves. This was not done to cultivate dishonesty, but to develop shrewdness



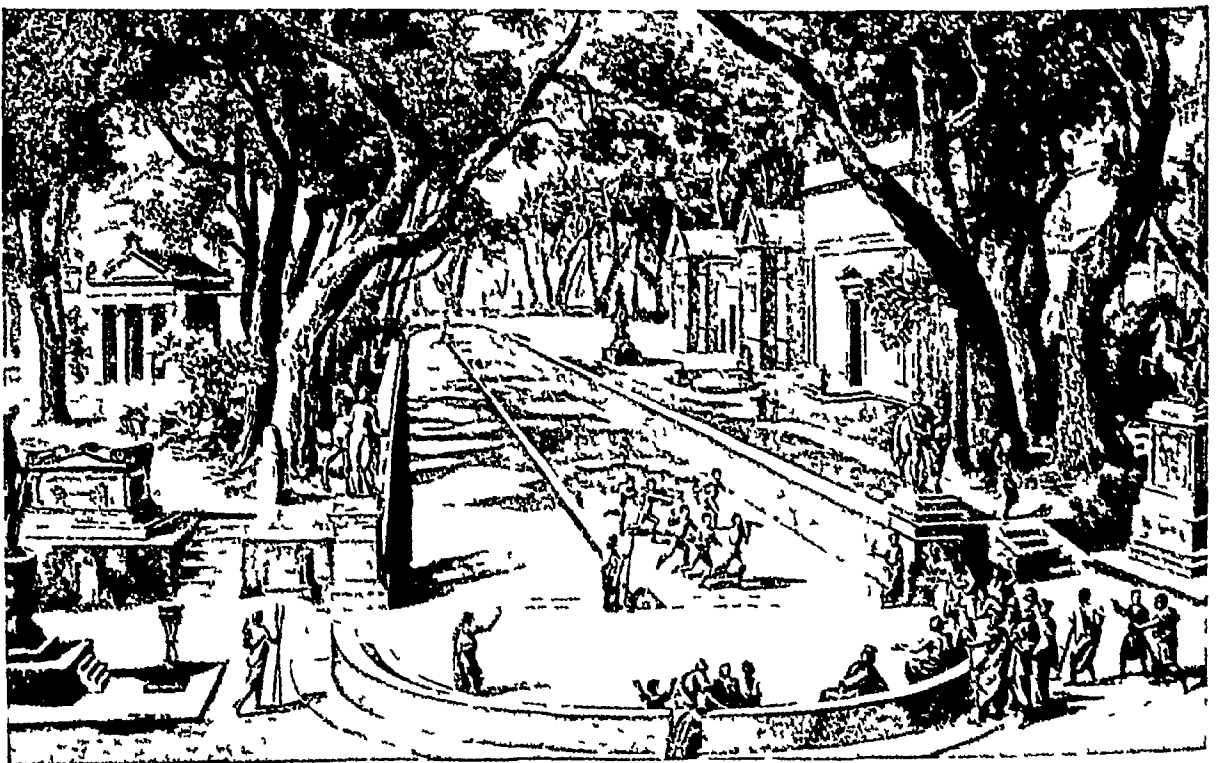
EARLY SPARTAN WARRIOR

This helmet is of the early Attic type, a cumbersome covering for the whole head and neck, with large cheek pieces. The sculpture is treated with bold individuality of style.

and enterprise. If they were caught, they were whipped for their awkwardness. Once, it is said, a Spartan boy, having stolen a young fox for his dinner, allowed the animal, which was hidden under his cloak, to gnaw out his vitals rather than disclose his theft by crying out. The girls were educated in classes under a similar, less rigorous system.

All Spartan citizens between the ages of 20 and 60 served in the army, and, though they were allowed to marry, all had to belong to a men's dining club and eat and sleep in the public barracks. They were forbidden to possess gold and silver, and their money consisted only of iron bars. War-songs were their only music, and their literary education was slight. No luxury was allowed, even in the use of words. They spoke shortly and to the point, in the manner

which we have come to call "laconic," from Laconia, the name of the district of which Sparta was the capital.



YOUNG SPARTANS IN THE MAKING

There was no place for weaklings in ancient Sparta. From their earliest years both boys and girls were trained to despise soft ways of living, and they grew up to be brave and hardy citizens. This picture shows Spartan youths exercising—for the most part naked—beneath the critical eyes of their elders. Some people say that modern Germany has followed Sparta in many of her ideals and methods, particularly in connection with the Youth Movement.

There were three classes of citizens in Laconia. The Spartan citizens (*Spartiates*), who lived in the city itself and who alone had a voice in the government, devoted their entire time to military training. The *Perioeci*, or "dwellers round," who lived in the surrounding villages, were free, but had no political rights. They were the tradesmen and mechanics—occupations not allowed to the Spartans. The *Helots* were serfs, or slaves, forced to cultivate the soil for the citizens, their masters, who owned the land.

Another strange feature of Sparta was that the government was headed by two kings, who ruled jointly, serving as high priests, as well as leaders in war. Each king acted as a check upon the other. There was a sort of cabinet composed of five *ephors*, or overseers, who exercised a general guardianship over law and custom, and came in later times to have greater power than the kings. The legislative power was vested in the assembly of Spartan citizens and in a senate or council of elders, which was chosen from the men over the age of 60.

The Spartan armies were all but irresistible. Each citizen soldier was inspired by the resolve to win or die. The Spartan mother, when she gave her son his shield, used to say "Bring back this shield yourself or be brought back dead upon it."

The Spartan constitution is said to have been founded by Lycurgus (q.v.). Under the rigid discipline of its laws Sparta extended its conquests over the neighbouring states until it gained control of most of the Peloponnesus.

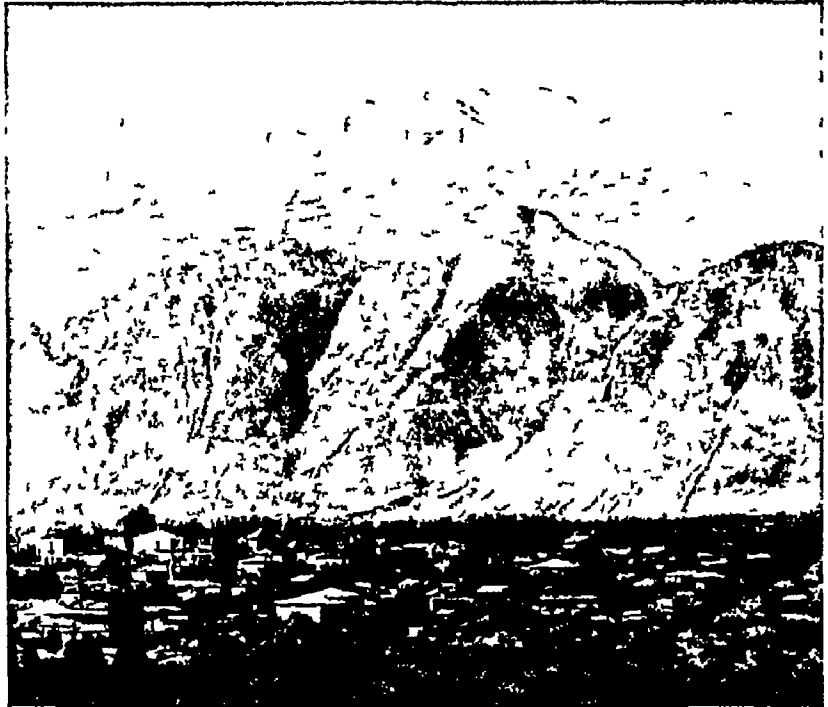
Sparta's prowess naturally brought rivalry with Athens, the leader of the northern states and for a time of all Greece. This rivalry culminated in the Peloponnesian War (431–401 B.C.), which resulted in Athens' ruin and Sparta's supremacy. But the tyranny of the Spartans aroused rebellion, and the jealous limitations on citizenship gradually cut down the number of specially trained warriors. After about 30 years of Spartan domination, the Thebans, under Epaminondas, defeated Sparta in 371 B.C. With the rest of Greece, Sparta was soon conquered by the Macedonians, and finally became a part of the Roman Empire. (See Greece.)

The modern town of Sparta, built after the Greek War of Independence in 1834, covers part

of the ancient site, near the river Irí (the ancient Eurotas), and is about 15 miles from the Gulf of Messenia. Its population is about 6,000.

Spartacus (died 71 B.C.) The danger of an uprising of slaves was constantly in the minds of the old Romans, for there were in the Empire about three slaves to every free man. Many such rebellions took place, but the most formidable was that headed by the Thracian, Spartacus, in 73 B.C. Escaping from the school of gladiators at Capua, he fled to Mount Vesuvius, where he collected an army of runaway slaves like himself.

For two years he terrorized Italy, defeating army after army sent against him from Rome.



WHERE THE STERN SPARTANS USED TO LIVE

Few relics are left of ancient Sparta, the famous city of Laconia that once ruled the Peloponnesus; the southern portion of its old precincts is occupied by the present Sparta (above), a town of entirely modern origin. Note the formidable mountain barrier behind which probably influenced the development of the Spartan character.

Courtesy of British School at Athens

and laying the land waste from the foot of the Alps to the southern tip of the peninsula. But the insurrection was crushed, Spartacus was slain, and 6,000 of his followers were crucified along the Appian Way leading to Rome.

At the close of the World War of 1914–1918 the name "Spartacists" was applied to the extreme radical wing of the German Socialists, whose leader, Karl Liebknecht, had written under the pen name of "Spartacus." The Spartacists aimed at establishing a workers' republic, and there was fierce fighting before they were suppressed. Liebknecht was killed in January 1919.

Spectacles. Few persons have perfect vision. The eye is so delicate an instrument that the slightest irregularity in its structure produces serious defects of vision. (See Eye.) Many of these errors can be corrected by wearing

SPECTACLES



MAKING THE LENSES AND FRAMES OF SPECTACLES

These pictures show how eye-glasses or spectacles are made Top putting pitch on the lens to make it stick to the grinding machine, and the lens placed on the machine Below cutting out the tortoise-shell frames and fitting in the lens.

Photographs by courtesy of Walter H. Thompson Hatton Garden London

spectacles, which are lenses so ground as to counteract the faults of the eye

To find out just what lenses your eyes require, the oculist (eye specialist) makes a number of tests He asks you to read lines of letters of various sizes from a chart and to describe various pictures and combinations of lines which he shows you, and he examines the retina at the back of the eye with a strong light and a magnifying glass (*See Lens*)

Thus he finds out not only how much your vision differs from the normal, but also the cause of the trouble The eyes may be near-sighted, they may be far-sighted (all eyes become farther-sighted with advancing years), they may be so shaped as to give distorted images, very frequently the two eyes differ It is always well worth while to pay a high fee to have the eyes tested by a specialist Wrong lenses may do permanent harm to the eyes

The oculist writes a prescription for a lens for each eye The optician (spectacle-maker)

grinds, from plain lenses of specially prepared optical glass, lenses with the prescribed curves Those used to correct short sight are concave lenses, for far sight convex lenses are used, prisms, where the eyes turn in or out too much, segments of cylinders, for astigmatism or irregular curvature of the cornea, and endless combinations and modifications of these forms for complicated conditions

Then the optician fits the ground and polished lenses into frames, adjusting each lens so that its centre will come at exactly the right point in front of the pupil, and tilting it to give just the right angle for reading or distant vision

Glasses with side pieces to pass over the ears are known as "spectacles," while those which clip to the nose are called "eye-glasses" or "pince-nez" Single eye-glasses or "monocles" and glasses mounted on a handle ("lorgnette") are sometimes used Lenses of a special glass are designed to prevent harm by sun-glare by absorbing the ultra-violet rays

Convex spectacles were invented in the 13th century, perhaps by Roger Bacon. Bifocal lenses were invented by Benjamin Franklin these have a small lens for reading and near vision, set into a larger lens for distant vision. The old style lens gave perfect vision only at the centre, the modern "toric" lens gives the same correction to the sight right to the edge.

Spectrum AND SPECTROSCOPE No doubt you have at times seen little rainbows projected from the bevelled edge of a mirror or from a prism. Did you guess that you held in your hand the key to one of the most wonderful secrets of Nature?

Not until 1627 was it possible to explain the colours of the rainbow.

In that year Sir Isaac Newton described his experiments in passing sunlight through a glass prism, which showed that a beam of white light is a bundle of rays of different colours—red, orange, yellow, green, blue, indigo, and violet.

For one thing, he showed that if a small beam of sunlight were admitted to a darkened room and passed through a prism, it produced a band of colours exactly like those of the rainbow, ranging from red through yellow, green, and blue to indigo and violet. He then passed each of these colours through another prism and found that they did not change, but when the whole band of coloured light was passed through a prism in reverse position to the first, it became white sunlight again. From this he reasoned that white light was really a mixture of coloured lights, and that each colour was bent by a different amount when it passed through the prism, so that it would stand out separately and be visible. (See Colour) Such a band of coloured light is called a spectrum, and the rainbow is an example. (See Rainbow)

Spectroscopic separation of light into its colours is called dispersion, and is a result of

the refraction produced by the prism. While refraction is explained in the article on Light, it may be said here that the coloured rays bend different amounts on passing through a glass prism, red being bent least and violet most.

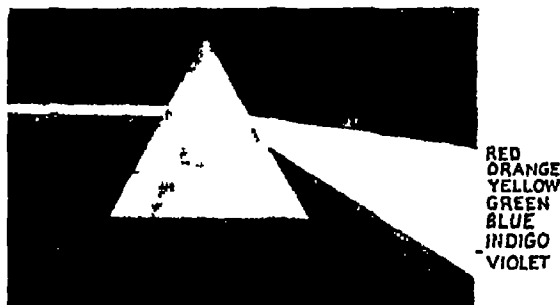
We now know that different colours belong to different wave lengths of light, and that a beam of sunlight contains as many wave lengths of light as there are shades of colour in the spectrum. Now look at a spectrum and see how the colours shade gradually and continuously into one another, and notice that there are countless numbers of shades.

With a beautiful device called a diffraction grating, Professor Rowland stretched out the spec-

trum of the sunlight. This he photographed and got a spectrum band more than 20 feet long, so that he could measure thousands of wave lengths in the sunlight. These wave lengths tell us a most interesting story.

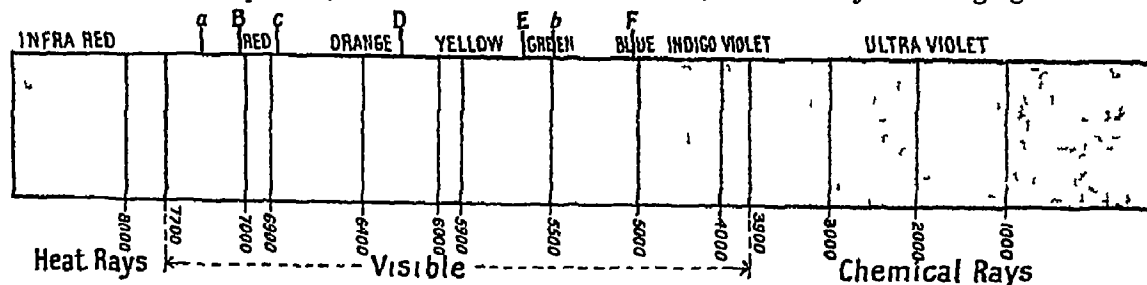
When a body is made so hot that it turns to vapour or gas, its atoms vibrate rapidly enough to give off light. In order to test this, throw into a gas flame a little common table salt, and notice the bright yellow light that results. That light is due to the vibrating sodium atoms of the vaporized salt, and a corresponding line of yellow light always appears at a certain place in the spectral band when it is present. No other kind of hot gaseous atom gives off those peculiar wave lengths of yellow light or causes those particular lines to appear. (See Atom, Colour, Light, Radiation)

If we examine the spectrum of several stars and planets in succession, we see several very interesting things: first, that the spectra of all the planets have the same lines and that these are the same as the lines in the spectrum of the sun. Why? Because the planets are not self-luminous, but shine by reflecting light from the



THE COLOURS OF THE SPECTRUM

A beam of white light passing through a glass prism is bent as shown, and split up at the same time into its constituent colours. These colours—violet, indigo, blue, green, yellow, orange, and red—are called the colours of the spectrum.



THE SPECTRUM OF VISIBLE AND INVISIBLE RAYS

The colours in the spectrum are in order of decreasing wave-lengths, those at the red end having a longer wave-length than those at the violet end. Wave lengths are usually expressed in "Angström units" which represent one ten-millionth of a millimetre. At each end of the spectrum are the invisible rays—the long wave-length heat rays, or infra-red radiation, and the short wave length actinic rays, or chemically active ultra-violet radiation. The letters at the top are "Fraunhofer's lines."



MEASURING THE SPECTRUM OF A STAR

Paul Popper

The spectra of stars are photographed on long narrow plates such as that seen in the centre of this picture, taken at the new London University Observatory at Mill Hill. The distance between the lines, and their width also, are measured under a travelling microscope, as on the right. The wheel on the end of the instrument is the head of a micrometer screw which moves the microscope across the plate so that the hair line can be brought over each line of the spectrum in turn. The necessary calculations are done by the man on the left, who is operating a hand-driven calculating machine.

sun. But when you look at the other spectra, you find that they are very different from one another. Some have some very bright red lines, others are more brilliant in the green, and so forth, but all have many hundreds of lines in them. Each is equally as distinctive of the star as a man's finger-prints are of the man. Astronomers spend much of their time examining and interpreting these spectra, they are photographed so that the positions and intensities can be measured very accurately.

Learning about the Stars

These spectra show what chemical elements are in the surface of the stars, and what their relative abundance is, almost as accurately as if we had samples of the material to analyse in the laboratory, they tell what the temperatures of the surfaces are, as accurately as we can measure the temperatures of our furnaces, they tell what the velocities of the stars are along the line of sight, their masses, sometimes their speeds of rotation, sometimes whether they have companions, as well as many other things.

From this and some additional information, the astronomer can apply mathematical principles and principles of physics that can be proved by experiment in laboratories here on earth, and so build up a description of just how the star must be constructed or must have evolved in order to give the spectrum that it does.

When the light from an incandescent solid or liquid is thrown directly through a prism

to produce a spectrum, it causes the bright lines characteristic of its elements to appear in a continuous spectrum. This is called an "emission" or "bright line" spectrum.

If, however, the light, on the way to the prism, passes through a gas at a lower temperature, the gas "absorbs" the lines characteristic of it, and corresponding dark lines appear in the spectrum. This is called an "absorption" spectrum, and the dark lines are known as "Fraunhofer lines," after the Bavarian optician who discovered them in the spectrum of sunlight. Their appearance in the spectrum of sunlight is explained by saying that an outer wrapper of gases about the sun absorbs the bright lines produced by the gases at the centre of the sun.

A beautiful example of what spectroscopy, or the study of spectra, can do is afforded by the story of the rare gas helium. (See Helium)

Another marvellous fact is that the lines in the spectrum of a star shift towards the violet side if the star is moving towards the earth, and towards the red side if the star is moving away. This is due to the crowding together of the vibrations, making the vibrations appear to be of shorter wave-length in the one case and longer in the other, an effect named after its discoverer, Doppler.

The little rainbow we have been talking about is known as the "visible spectrum". But since all the various shades of colour we

can see are caused by vibrations or waves of varying frequency, it is natural to expect that an "invisible spectrum" exists—a spectrum containing waves shorter than the shortest light wave and other waves longer than the longest light wave. And so it does, with a tremendous range of wave lengths (See Light)

In order to study spectra, ingenious instruments called spectrosopes have been devised. The oldest is the prism spectroscope, which uses the method developed by Newton. The light to be studied is admitted through a slit in one end of a horizontal tube, called the collimator, and projected by a lens at the other end upon one face of an upright prism. When it leaves the prism, broken up into a spectrum, it falls upon one end of a small telescope. The observer sits at the other end, and by moving the telescope about in a horizontal arc, which has its centre beneath the prism, can examine different portions of the spectrum. In order to increase dispersion, or separation of colours, a train of prisms is often used.

A more generally useful instrument is the diffraction grating invented by Fraunhofer in 1821. Here the light is reflected against a mirror, which has many fine parallel lines scratched across its face. These lines break up the light in such a way that the light is reflected as a spectrum. By using a concave mirror, Rowland, in 1882, increased the usefulness of this form of spectroscope. Special machinery is used to engrave these lines, and it works so accurately that thousands of lines can be ruled side by side across one inch of glass.

In the échelon, invented by Professor Michelson, instead of ruling lines on a mirror he placed plates of glass one behind another, each plate projecting beyond its neighbour, and thus obtained a wonderfully accurate diffracting surface. With these modern instruments, spectra several yards long, as compared with the several inches obtained by Newton, can be produced. Lines that formerly appeared single are broken up into families of lines, thus yielding an immense amount of detailed knowledge that could never have been obtained with the early crude instruments. Study of the lines in spectra has done much in helping to build the modern theory of matter.

Speedometer. A number of devices for indicating the speed at which vehicles travel

has been produced, perhaps the first being a speedometer which used a small centrifugal "governor" (See Steam engine). This was linked up to a pointer mechanism. A magnetic type is also used, and several other types have been adopted.

In the governor type of speedometer, when the shaft links, (marked *a* in the diagram below), and weights are rotated at a sufficient speed, the latter fly outwards under the influence of centrifugal force (qv), thereby moving a rotating rack along the shaft in opposition to the resistance of the control spring.

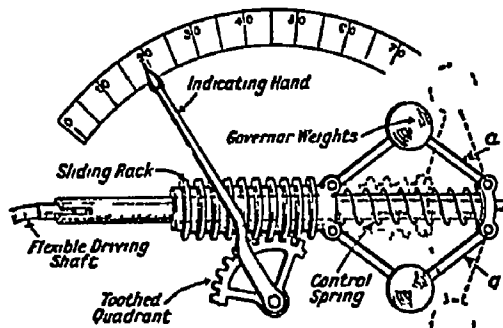
The indicator moves over the scale at the same time through the medium of a toothed quadrant engaging the rotating rack. The greater the speed of the shaft, the farther will the governor weights move away from the axis and the more will the control spring be compressed. The centrifugal force exerted by the weights balances the thrust exerted by the spring whatever the speed of rotation of the shaft. The smallest variation of speed of the shaft readjusts the position

of all the moving parts, and is immediately indicated by the pointer.

The magnetic type contains a permanent magnet shaped like a castellated cup and rotated continuously by the usual flexible shaft. Mounted over the magnet is an inverted cup shaped armature usually constructed of copper and free to move within certain limits. The movement of the armature is controlled by a light, flat, spiral spring similar to the hair spring of a watch, one end of the spring being fixed to the spindle of the armature, while the other is secured to the speedometer casing.

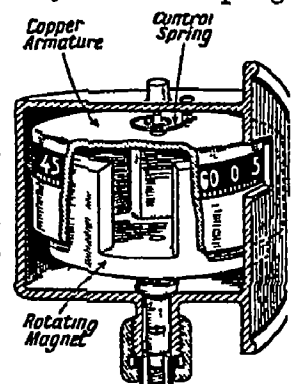
When the magnet is rotated by means of the flexible shaft the magnetic field of force surrounding the magnet tends to drag the armature round with it, but the movement of the armature is resisted by the control spring.

The higher the speed the greater is the force exerted on the armature and the larger the angle through which it is turned, until a state of balance is reached, when the force exerted by the magnet is equal to the resistance set up by the control spring, giving a steady reading. The speeds in miles



HOW SPEEDOMETERS WORK

This drawing explains the working of the 'governor' or centrifugal type of speedometer. At the bottom of the page is a diagram of the magnetic type.



per hour are marked on the outside diameter of the armature and are read through a small window in the dial of the instrument.

Every ordinary speedometer includes in the same casing a mileage recorder or odometer which is usually provided with two indicators, one registering the total mileage travelled up to 10,000 miles or to 100,000 miles, while the other shows the mileage up to 100. The trip recorder can be set at zero before the start of a run and gives a three-figure reading the third figure being in red and representing tenths of a mile. The total mileage dial sometimes also shows tenths of a mile. The figures are arranged on the outer edges of disks. An odometer reading up to 100,000 will contain five master wheels geared to one another. Each wheel after making one revolution advances the wheel on its left hand side by one tooth, that is, it is rotated through a tenth of a revolution. Each wheel is thus provided with ten teeth, which are engaged by a single tooth on the next faster wheel. It is also provided with a tooth which engages the ten teeth on the adjacent slower wheel. Each wheel thus moves ten times as quickly as the one on its left.

This mechanism is exactly the same as that employed in a cyclometer or a simple revolution counter. These are operated by a striker, and only record mileage (i.e. revolutions performed). Motorists, however, are interested in the number of revolutions per minute of the engine. Revolution counters of this type are constructed on the same principle as the speedometer, but the mileage recording mechanism is omitted. The instrument is controlled by some form of centrifugal governor, or by magnetic means, in such a way that the pointer gives a reading at all speeds of the revolutions per minute of the engine, the revolution counter is driven by flexible shafting or belting and pulleys from the crankshaft, or from some other revolving part of the power unit, such as the camshaft.

Revolution counters are of great value in estimating engine "tune," and they enable the best use to be made of the indirect gear ratios.

Spelling. A great deal has been said about the difficulties of English spelling—much of which is not true. Learning to spell, of course, like everything else worth while, requires effort. But it need not be a "bogey." Everyone can learn to spell if he goes about it in the right way.

Many have said that English is not a phonetic language, that is, it is not spelt as it is pronounced. Let us look into this statement. Investigation shows that some 22 per cent of the words in common use are non-phonetic, but that leaves 78 per cent that are spelt as they sound, and are pronounced as they look. An authority on word study calls attention to the fact that "six of every seven syllables of

our language are phonetic." Such difficulties as there are, then, must lie in the 22 per cent non-phonetic words, and with one syllable in seven.

It has been estimated that the average person can read and understand between 8,000 and 10,000 words. Our writing vocabulary is much smaller, from 4,000 to 5,000 words are enough for all the writing we are likely to do.

To compile a scientific spelling list we evidently need to separate our writing from our speaking vocabulary, or, in other words, to find out just what words we use in writing. Thorough investigations have been made to discover what are the common words in the writing of school children and of adults. While no one of the several investigations has given us a list which we may regard as final, a composite list made up of the words that are common to a majority of these lists and series may be accepted as a writing vocabulary approximating that used by the majority of people.

Can You Spell these Words?

Some of the investigators have carried on tests to determine the relative spelling difficulty of the "commonest words," and have made groupings to indicate the school ages at which they should be learned. The following list of 101 words is widely cited as containing the most difficult of those which are in ordinary use.

which	writing	ready	choose	very
their	heard	forty	tired	none
there	does	hour	grammar	weak
separate	once	trouble	minute	often
piece	would	among	any	whole
meant	siege	busy	much	seize
business	sure	built	beginning	cough
many	loose	colour	blue	piece
friend	lose	making	though	raise
some	Wednesday	dear	coming	ache
been	country	guess	early	read
since	February	says	instead	said
used	know	having	easy	hoarse
always	could	just	through	shoes
where	seems	doctor	every	tomight
women	Tuesday	whether	they	wrote
done	wear	believe	hall	enough
hear	answer	knew	break	truly
here	two	had	buy	sugar
write	too	tear	again	struggle

An examination of these words shows that one third of them are *homophones* (word that are sounded alike but spelt differently, such as, *there their two too*). It is obvious that we cannot spell any homophonous word until we know which one of the pair or group it is, that is, we must know its meaning.

The other difficulties in English spelling are due chiefly to the confusion in the formative days of the language between the phonetic standards of Anglo-Saxon and Norman French, in part to the retention of old spellings and

pronunciations had changed, to the introduction of new spellings based on mistaken analogies and etymologies, and to the borrowing by English from every other language

It is economy of time to learn the spelling, pronunciation, meaning, and use of a word all at the same time. One of the serious mistakes of schools in the past was that they required pupils to spell words which were altogether beyond their understanding. The practice of the modern school is different.

See before You Spell

The first step in seeking to know a word is to see it exactly. Much, perhaps most, of mis-spelling is due to *half* seeing words. The second step is to pronounce the word precisely as it should be pronounced. If you say the word correctly, you will not write *perspiration* for *perspiration*, or *suprised* for *surprised*. You must form two images of the word—the visual (the *look* of it) and the auditory (the *sound* of it)—and these two images must be closely associated in your mind. Next, centre your attention on the critical point in its spelling by asking yourself, “What is the particular thing to remember about the form of this word?” The only difficult point about the word *thumb* is the silent *b* at the end. Fix your mind on that, connecting it with such words as *climb*, *comb*, *lamb*. You will never forget how to spell *separate* if you associate it with *parade*, which has the same Latin root. Then analyse the word, separate it into its parts, put together the meanings of these parts to see just what the word originally meant, or literally means, try to explain how the present or derived meaning comes from the original meaning. For example, take the word *conductor*. The dictionary shows us that it comes from the Latin *con* (with or together) + *ducere* (to lead) + *or* (one who). A conductor, then, is one who leads or directs other people. A knowledge of the derivation of a word frequently helps us to remember a peculiar spelling, as *Wednesday*, from *Woden*. Finally comes the meaning of the word. This includes definition and use, or uses. There should be practice in the use of words in sentences, in all the various senses a given word may have.

Words Arranged in Groups

The best type of spelling book not only makes its selection of words by a comparative study of the lists and scales of the investigators, but it organizes these words according to scientific pedagogical principles. Derivative forms are grouped so that pupils come to see the system by which they are built up. Homophones are presented first in illustrative phrases or short sentences. Words phonetically similar are brought together, so as to make use of the principle of association. Interest is stimulated by

the use of every proper device. By such means the number of separate facts that must be learned is reduced.

While it is true that only a few rules for spelling English words are really helpful, those few do help, particularly when the pupil arrives at them for himself *after* studying groups of illustrative words. The addition of the suffix *-ing* to *write*, *ache*, *guide*, *desire*, *bruise*, *increase*, *prepare*, etc., enables us to formulate the rule for dropping the final silent *e* before suffixes beginning with a vowel.

By adding *-ed* or *-ing* to *mar*, *confer*, *refer*, *submit*, *acquit*, *control*, etc., we learn that monosyllables and words accented on the last syllable, ending in a single consonant preceded by a single vowel, double the final consonant before a suffix beginning with a vowel.

Such words as *deny*, *comply*, *query*, *verify*, *dusty*, *muddy*, *homely*, *pretty*, *jolly*, and others ending in *y* preceded by a consonant, change *y* to *i* before *ed*, *er*, *est*, *able*. Thus *denied*, *complied*, *dustier*, *muddiest*, *prettiest*, *verifiable*. But note the forms *denying*, *complying*, *studying*.

The final *e* is dropped before an ending beginning with a vowel (as *seize*, *seizure*, *conceive*, *conceivable*), but retained before an ending beginning with a consonant (as *achievement*, *encouragement*). The *e* is also retained when needed to keep the identity of a word (as *dyeing*, *shoeing*, *hoeing*), or to keep the soft pronunciation of a *g* or *c* (as *peaceable* and *changeable*). (*G* and *c* before *a*, *o*, and *u* are pronounced as in *gave* and *cat*, before *e*, *i*, and *y* they are pronounced as in *gentle* and *centre*.)

Rules for Forming Plurals

Most plurals are formed by adding *s* to the singular. But words ending in *s*, *x*, *z*, *ch*, *sh*, form the plural by adding *es*. Thus *circuses*, *taxes*, *churches*. Singular forms ending in *y* preceded by a consonant form the plural by changing *y* to *i* and adding *es*. Thus *salaries*, *factories*, *remedies*, *cherries*, *libraries*.

To avoid confusion between *ei* and *ie*, keep in mind the word *Alce*, in which you have *li* and *ce* to remind you that *i* follows *l*, and *e* follows *c*. This will help with words like *believe*, *relieve*, *receive*, *perceive*, etc., but it applies only when the sound is long *e*. Otherwise *ei* is the more usual spelling, as in *deign*, *vein*, *rein*, *freight*, *height*, *sleight*, *foreign*, *counterfeit*, *heifer*. The old jingle is “Use *i* before *e* except after *c*, or when it's like *a* as in neighbour or weigh.” But remember the exceptions *financier*, *seize*, *weird*, *either*, *neither*, *leisure*, *inveigle*.

If you are confused about whether to end a word in *able* or *ible*, try to think whether there is a noun related to it ending in *-ation*. If a word has a noun ending in *-ation*, the adjective generally also has *a* in its suffix, and ends in *able*. Thus *accuse* has the noun *accusation*,

and the adjective *accusable*, and we have *limitation*, *limitable*, *duration*, *durable*, *detestation*, *detestable*, etc. If there is no noun ending in *-ation*, the adjectives usually end in *-ible*, as *collectible*, *digestible*, *repressible*, etc.

There have been many attempts to introduce simplified spellings. The first was that of Noah Webster, who, in his "American Dictionary" (1828) dropped the *u* from such words as *favour*, *honour*, *mould*, *colour*, and changed the French-derived *metre*, *centre*, *theatre*, etc., to *meter*, *center*, *theater*, etc. These simpler spellings have largely taken the place of the others in the United States of America.

"Spelling bees" have again become popular in the past few years, particularly in America. A spelling bee is a competition between a number of players to find out who is the best speller. In February, 1938, the first international spelling bee between Great Britain and the United States was broadcast by arrangement between the B.B.C. and the National Broadcasting Company of America.

Spenser, EDMUND (1552-1599) This great Elizabethan poet will be remembered for all time by the rich music of his allegorical poem in praise of moral goodness, "The Faerie Queene."

Here fair ladies, courtly knights, powerful enchanters, and fearsome monsters pass before the reader's gaze, with the idealized form of Queen Elizabeth as the principal character (Gloriana). Although the poem often becomes

little more than a series of more or less disconnected episodes, the enchantment of Spenser's inimitable verbal music runs through it all.

The poet was educated at Merchant Taylors' School, London, and at Pembroke Hall, Cambridge, and was early introduced at Court. For his services as secretary to the Lord Deputy of Ireland he received large estates in County Cork. While at his Irish seat, Kilcoman Castle, in 1589 he read part of "The Faerie Queene" to his friend, Sir Walter Raleigh (see the illustration in page 3431), who persuaded Spenser to bring the poem to London, where he was received in audience by Queen Elizabeth. In 1597 Kilcoman Castle was burned and sacked in Tyrone's rebellion, and the poet died soon after. He was buried in Westminster Abbey.

His other works include "The Shepherd's Calendar" (see page 1531), "Colin Clout's Come Home Again," describing his visit to London after nine years' absence in Ireland, the splendid marriage songs, "Prothalamion" and "Epithalamion", "Astrophel," an elegy on the death of his friend, Sir Philip Sidney, and, in prose, "View of the State of Ireland."

Sphinx. Chiselled from solid rock probably 2,800 years before the birth of Christ, the Great Sphinx of Gizeh, like a gigantic sentinel, still guards the cemetery at the entrance of the Nile Valley. It has the body and paws of a lion, but its head is a portrait of King Khafra, who built it and placed it before his pyramid tomb. It was worshipped as the sun-god, Harmachis.

Grains of sand, caught up by the hot swirling winds of the desert, have scratched and chipped and rasped the solid rock until all the sharpness of angles and lines has melted away. The beard and nose have gone, the "graceful smile" described by visitors of old has vanished, leaving the strange inscrutable look which led the Arabs to call it the "Father of Terrors." But the great mass of the body remains in crumbling outline, defying time and men.

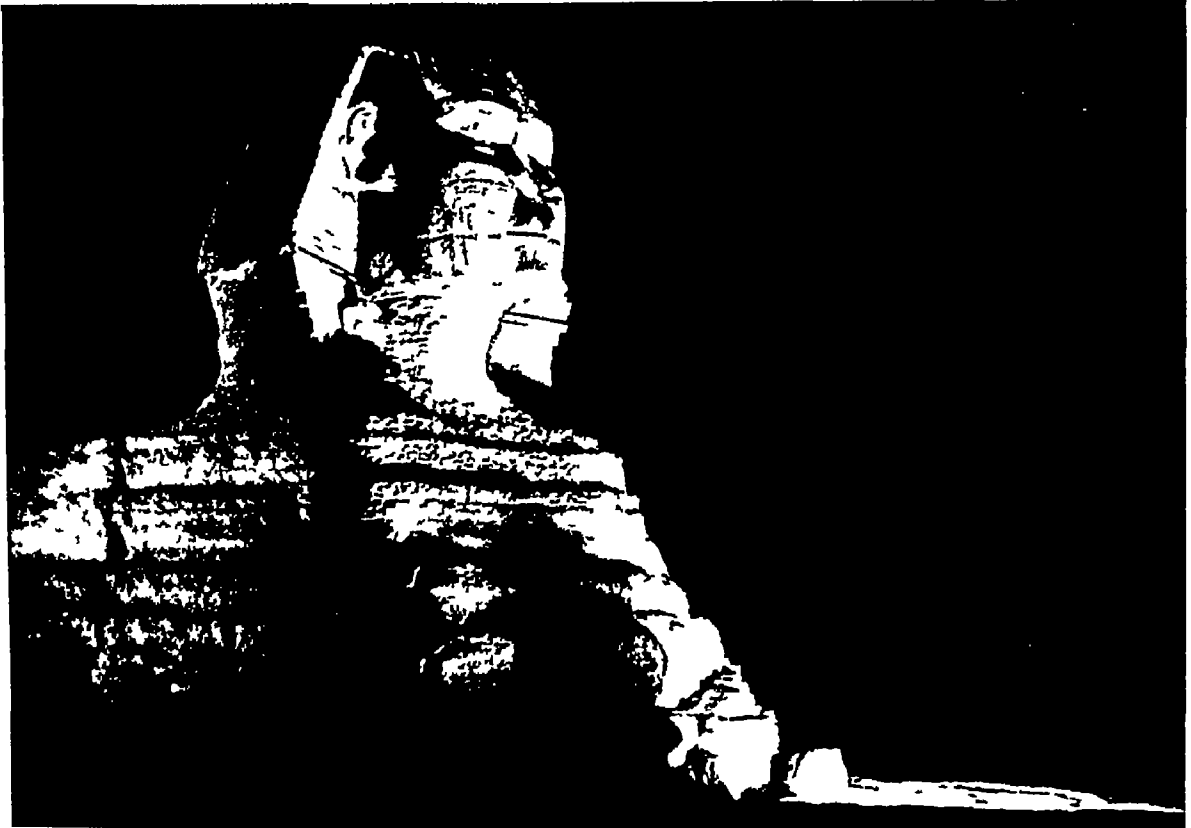


SCENE FROM SPENSER'S 'FAERIE QUEENE'

In the first book of "The Faerie Queene" is told the story of Una, a pure and beautiful damsel, and the Red Cross Knight. Una had as her guardian a lion, and on her wanderings incurred the enmity of an old blind woman and her daughter, into whose house the lion forced a way. This is the incident depicted above, in a painting by William Hilton, R.A.

The head of the sphinx measures 19 feet from top of forehead to bottom of chin and 91

EGYPT'S SPHINX BY DAYLIGHT & FLOODLIGHT



Khafra Pharaoh of Egypt from about 2867 to 2811 B C , perpetuated his own memory and features by having his portrait carved from rock as the head of the great Sphinx at Gizeh, near Cairo . The face is 14 feet broad and the creature s body 240 feet long . In 1926 the sand between the paws was cleared away, as seen in the upper photo . The lower picture shows Khafra s features brought to life by the modern wonder of floodlighting a practice first begun here in December 1937

Photos top "The Times" bottom Wide World



KARNAK'S AVENUE OF SPHINXES

The ancient Egyptian city of Thebes lay along the east bank of the Nile, the northern half of its ruins being now known as Karnak, and the southern as Luxor. At the former are three great brick enclosures, wherein temples once stood, and towards the northernmost of these runs this remarkable avenue of small sphinxes, still wonderfully preserved for all their thousands of years.

Courtesy of the Egyptian Travel Bureau

feet in circumference at the broadest part, with the shoulders and the upper portion of the paws extending forward 56 feet. The body is 240 feet in length, while the height from the ground to the top of the head is 66 feet. These dimensions were discovered in 1926, when the Egyptian government succeeded in digging away the surrounding sand, revealing the complete body of sculptured rock and the paws of built-up stone. Smaller sphinxes exist elsewhere in Egypt, often standing in pairs at the entrance to a temple.

From the Egyptians the Greeks borrowed their idea of a sphinx, which they conceived as a monster with the head of a woman, the body and paws of a lion, and huge bird-like wings. According to the story, the famous sphinx that lived on a hill above the city of Thebes in Boeotia put a riddle to all those who passed by, and devoured all who failed to guess it. After many had died in this way, the Theban hero, Oedipus, succeeded in solving the riddle and so caused the monster's death. (See illustration in page 3039)

Spices AND CONDIMENTS In medieval England the customary winter diet consisted of meal and coarse salt meat, which became unpalatable by spring. So spices were in enormous demand to lend some savour to this monotonous and tasteless fare. Cinnamon, cloves, and pepper were worth their weight in gold, and for centuries these condiments were

among the most important articles of commerce. The spice trade was a leading factor in determining the rise and fall of states, in provoking wars, and in discovery and exploration. It was chiefly the desire to find new ways of access to this vastly profitable trade that led to the discovery of sea routes to the East and the discovery of America.

Arabia was at first the great distributing centre for spices, which were brought overland in great caravans. Venice rose to world power through her control of the Mediterranean trade in spices and other imports from the East. When Venice

lost command of this trade as the result of the discovery of new sea routes to the East, first Portugal, then Holland, rose to wealth and power largely through the spice monopoly. It was mainly to break the grip of the Dutch on the profitable spice trade that the East India Company was formed.

Many of these aromatic substances have other uses besides that of flavouring agents in food. Some are valuable in perfumery, confectionery, and scented soaps, as vanilla, cloves, and pepper, or in the manufacture of incense, as cinnamon. Many are utilized in medicine, as cardamom, ginger, nutmegs, oil of cloves, etc. Turmeric is used in dyeing, especially by the natives of India and China, and marjoram serves in dyeing wool.

A large proportion of the spices are successfully grown only on islands, or near the sea. Nutmegs, cloves, vanilla, cinnamon, and cardamom may be termed island plants, and long before the "spice islands" are in sight sailors know that they are near by the heavy fragrance borne to them by the land breeze.

The flavour of spices is due to the presence of aromatic oils secreted in the plant, but these oils are richest in different parts of the various plants. In cloves and capers it is the flower-buds which are particularly aromatic, in coriander, capsicums, and pepper it is the fruit. The ginger, liquorice, and turmeric of commerce are roots or underground stems, and

SPICES

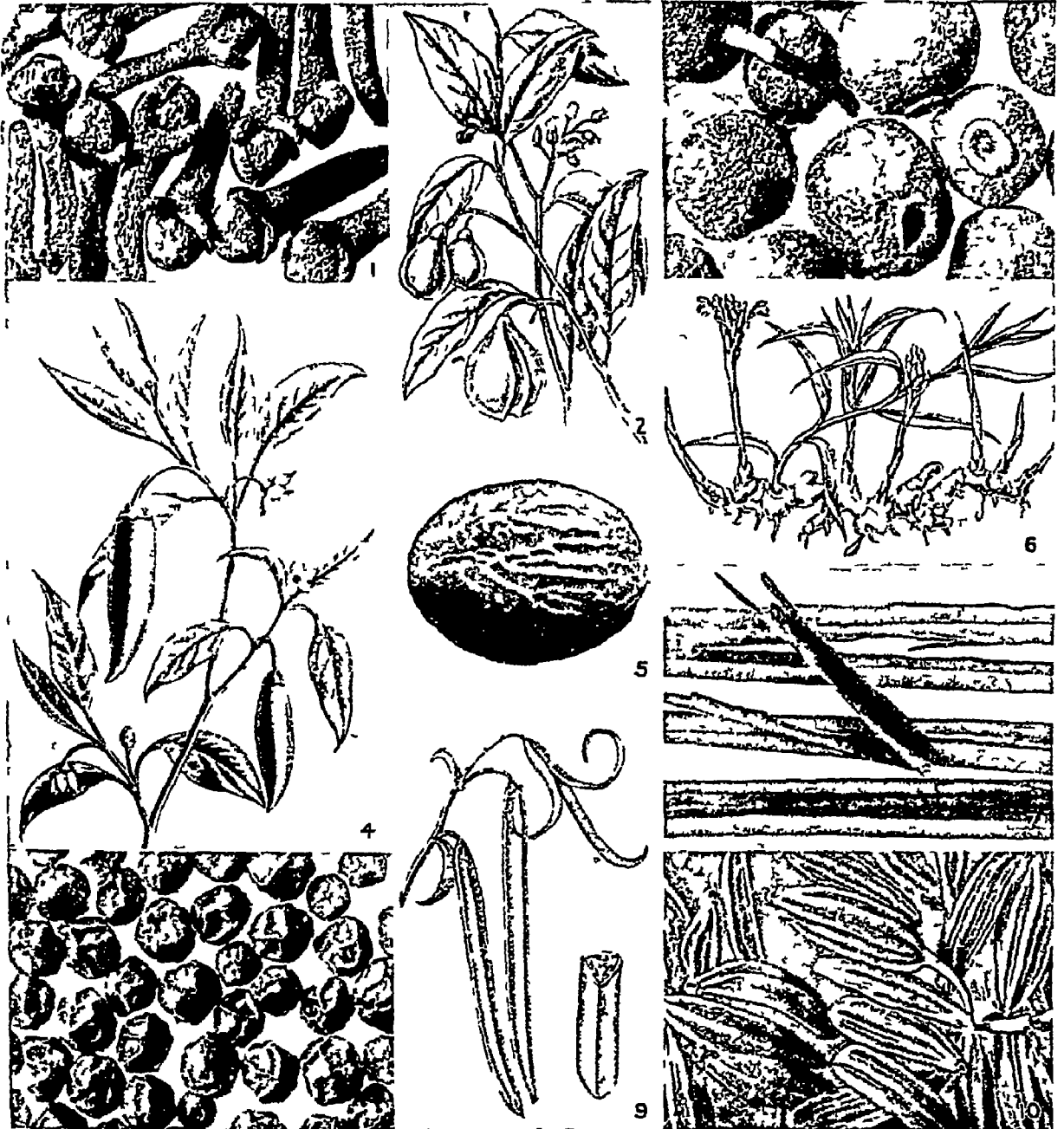
cinnamon and cassia are the inner bark of a tree. In most of the savoury herbs the leaves are richest in these essential oils, while nutmegs, caraway, and anise are seeds.

When the flower-buds are utilized they are plucked just before they are ready to break into blossom. The whole clove, as we find it in shops, is the dried flower-bud of a small bushy tree. The four petals are closed into a tight ball, held by four fleshy sepals. Capers are the salted and pickled buds of a species of spurge which grows wild on the mountainous slopes bordering the Mediterranean Sea.

The flower is "sensitive," opening when the sun strikes it, and must, therefore, be gathered very early in the morning.

Cinnamon comes from a small evergreen tree, growing best in Ceylon. This aromatic bark has long been popular, having been highly prized in Biblical times. Resembling it in flavour is its close relative, cassia bark. Cassia buds, the dried fruit of the cassia tree, are also used.

Pimento or allspice—not to be confused with the pimiento (see Pepper)—consists of the little unripe fruits of a tree which resembles the clove. The spice takes its name allspice from



HOW SPICES AND CONDIMENTS GROW IN THE WILD

Here are some of the principal spices and condiments we use in our foods: (1) cloves, about twice natural size, (2) a branch of the nutmeg tree, much reduced, showing flowers, leaves, and fruit, (3) allspice berries, highly magnified, (4) a flowering and fruiting branch of red pepper, (5) a nutmeg, (6) a growing root of ginger, (7) cinnamon bark, (8) black pepper berries, somewhat magnified, (9) vanilla beans—the pods are seven or eight inches long, (10) caraway seeds, highly magnified.

its resemblance in perfume and taste to a mixture of cinnamon, cloves, and nutmeg. The word pimento comes from the Spanish for pepper.

Coriander is one of the oldest known spices. It is the fruit of a small herb growing on the shores of the Mediterranean, and also largely cultivated in India. It is valued in confectionery, and is used to disguise unpleasant

tastes in medicines, and as an ingredient in curry powder. One of the spices often used in curry is the cumin, which is also used as a substitute for caraway seeds in seed cakes.

Another group of seasoning plants are the "kitchen herbs." Among these are marjoram, mint, thyme, sage, and parsley. (See also Nutmeg, Mint, etc.)

The SPIDER in his 'PARLOUR'

Though the spider is not itself an insect, it terrorizes that tribe of creatures, capturing them in its cunning snares of gossamer. Read here about its almost human intelligence and the queer customs of spider-land.

Spiders. The spider is a robber baron, pirate, bandit, preying on the insect world. We praise and protect the bee, the organized



Web of garden spider

worker, the respectable member of society, but we often strive to destroy the spider. Yet if we study the ways of spiders instead of killing them, we shall find them amongst the most interesting as well as the most useful of living creatures. Only a few of the rarer species are poisonous to Man, and even these bite only when molested.

In their struggles for existence, spiders have developed amazing instincts for concealing themselves, protecting their young, and capturing their prey. This last is of the utmost importance, for all spiders are carnivorous, feeding only upon creatures that they are able to catch.

Except in the Arctic regions and on the tops of the highest mountains, where there is no insect life as food supply, spiders are found in all parts of the world, even in remote islands. Some catch their prey by speed of foot, some by leaping like tigers from ambush, some by means of the marvellous silken webs they spread in their victim's path.

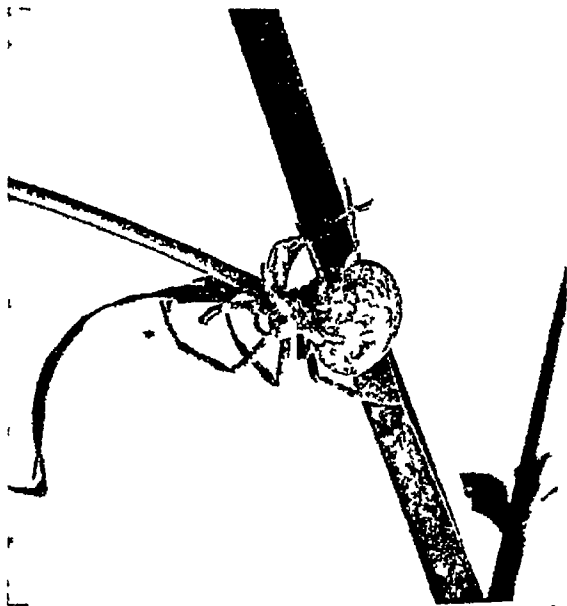
Spider webs are of many kinds and shapes. Some are shaped like funnels, others are closely woven sheets with the appearance of tissue paper, but the most beautiful and conspicuous structures are the wheel-shaped webs, woven with geometrical precision, of the so-called orb spinners.

The common garden spider (*Epeira diademata*) is among the most skilful of the orb spinners. You can find a web in almost any garden, stretched across a fence corner or between the low branches of stout shrubs. The lady of the house, distinguishable by her big, rounded,

brown or green body, with regular white markings, sits in the middle of the web waiting for visitors. If you touch the web lightly, or throw a small object into it, she rushes at it, ready to attack the intruder, for it is by the trembling of the web that she knows that something has been caught.

When a hard rain or wind comes along, the web may be wrecked. Then you may watch the spider build it again. She drops, or jumps, from one support to another, paying out her silk cable behind her, and fastening it wherever she can. Soon she has an irregular space enclosed. Do you know how fine these lines are? You would have to lay four or five thousand of them side by side to make a ribbon an inch wide. Round those lines she runs, pulling them with her hind foot to test their strength. If one breaks she spins another.

Soon she has her space cut into four nearly equal parts. Then she spins other spokes across

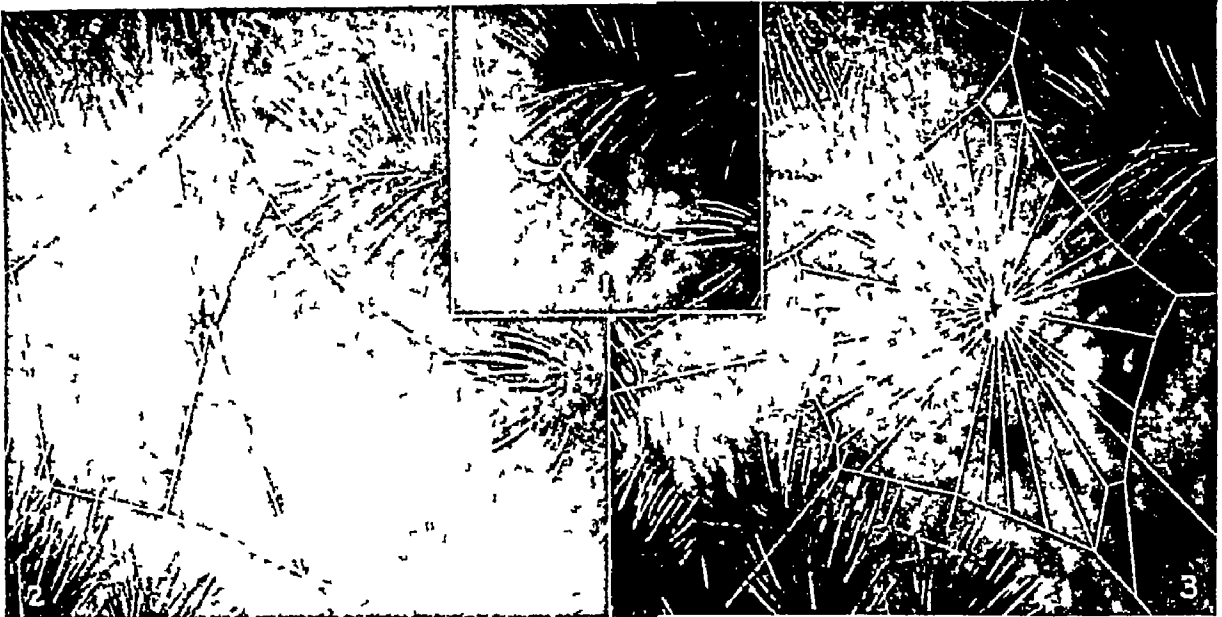


J. J. Ward

SPIDER PIRATE IN HIDING

After constructing its web, the spider retires to a hiding-place near by, taking with it a single thread, by which it remains in communication with its gossamer fly-trap. In this photograph we see a female garden spider resting outside her snare, with her hind-leg clutching the communication cord.

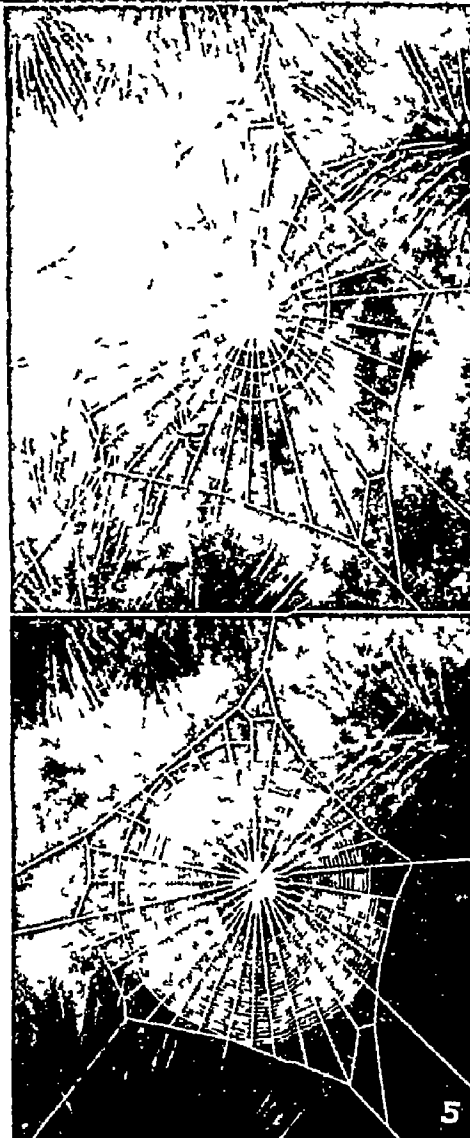
SPIDERS



These are actual flash-light photographs of a web under construction. Four and a half hours elapsed from the time Mrs. Spider began until she finished, but she was temperamental and loafed three fourths of the time.

the centre. The many crossings make a stout hub. Starting at this hub, she weaves a spiral line, crossing the spokes and glueing the joints. The spiral is carried round four or five turns. This is the temporary scaffolding, made of tough threads like the spokes.

Now she starts near the outside edge of the wheel and circles round towards the centre. This time she uses a much better silk, studded with little sticky beads. It is this thread that catches and holds the feet of unwary insects. As she travels back to the hub, the spider cuts the scaffolding away. When the new sticky spiral is complete, she spins new support lines from the outer rim of the web to the supporting branches and pulls them tight, until the whole structure is taut. It has taken less than an hour to make the web. If it is destroyed, the spider seems to have plenty of material to build another, for in the hind part of her body are the little "spinnerets" from which it is woven. The web starts as a liquid, which hardens on contact with air.



After hanging the first cable (1), she built a sort of frame (2), into which she fitted spokes, as in a wheel (3). To hold the spokes in position a spiral round the centre was added (4), and soon the web was ready for its prey (5).

It is the female who does this work, and you will nearly always find her living alone. She builds her own house, catches her own food, looks after her family, and lives most of the time in a state of busy solitude.

A long time ago the work of the spider was looked upon as pure magic and the Greeks made a myth about her. The spider, they said, was a maiden named Arachne, who challenged Athena to a contest in weaving, and proved herself more skilful than the wise goddess. Enraged that a mortal should be more clever than herself, the goddess tore Arachne's work to pieces, and the disconsolate maiden tried to hang herself. But Athena in her mercy changed the rope into a cobweb and Arachne into a spider, telling her to spend the rest of her days in making her wonderful webs. (See Athena.) It is because of this story that the scientific name *Arachnida* was given to the spider and its relatives.

Sometimes you will find a spider's web bridging a small stream. How was the first

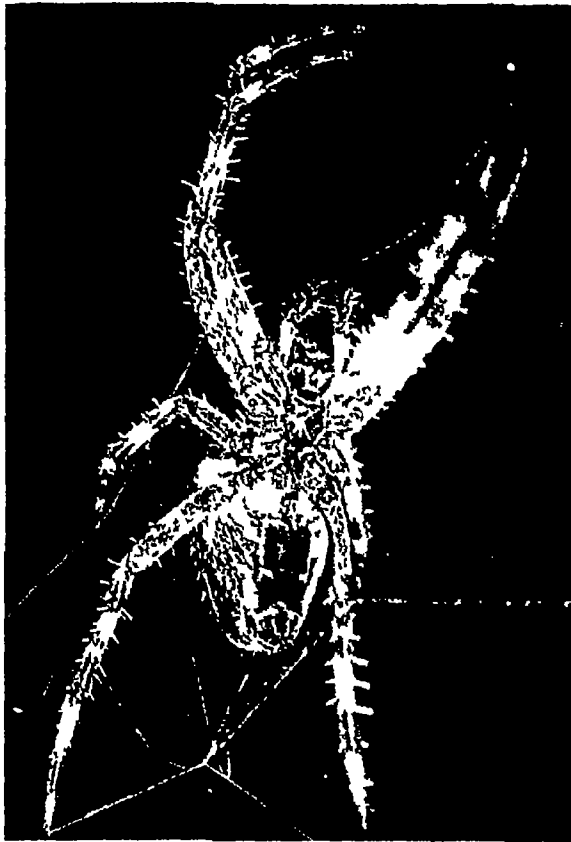
ONE NIGHT IN A GARDEN SPIDER'S LIFE

SPIDERS

thread carried across? The spider simply waited until the wind was in the right direction and then mounted to a high branch and released a long free thread

It was carried over by the breeze, became entangled in the shrubs on the other side, and then was drawn tight and fastened. Provided with this first cable path across the chasm, the spider found it easy to stretch the other foundation lines

Many spiders do not live on their webs, but hide in small woven nests near by. From the centre of the web they stretch a tight line to their den. This acts like a door-bell. A grasshopper, perhaps, jumps into the net. Quickly the spider rushes out, fastens a broad swathing band to the big



H. E. Lowrey

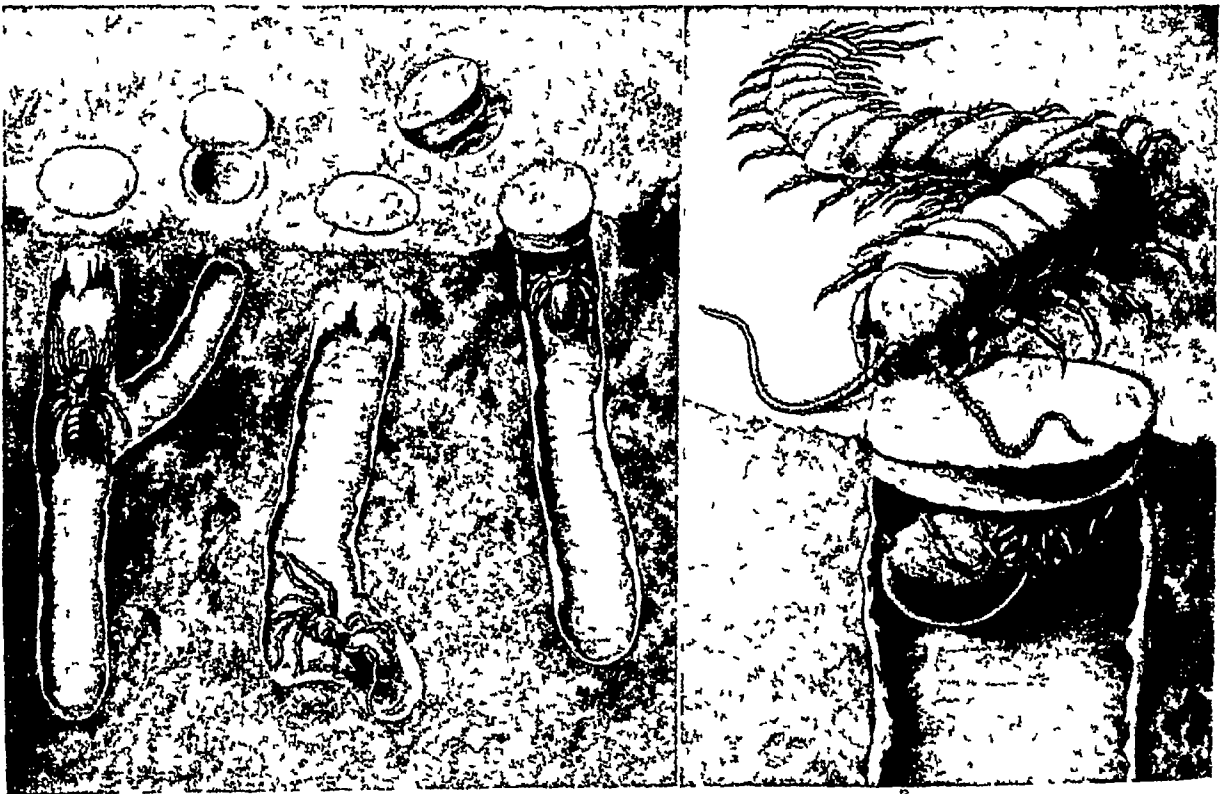
HOW THE SPIDER'S WEB IS WOVEN

In this wonderful close-up photograph you see just how the clever spider "handles" its web. One strand may be seen coming from the spinneret in the end of the spider's body, while others are dealt with by the last two pairs of legs

floundering insect and by a few dexterous kicks rolls it over two or three times until it is unable to move. Then a quick bite with her poison jaws completes the work

Spiders use their silken threads for many other purposes than spinning webs. A cocoon is woven to contain the eggs, and is either fastened to a leaf or twig or is carried about by the mother underneath her body until the young hatch. Many species then transport the baby spiders on their backs until the youngsters are old enough to look out for themselves

The trap-door spiders dig holes in the ground and conceal the opening with hinged covers, lining the inside of their tunnels with a layer of



A TRAP-DOOR LETS HIM IN AND KEEPS HIS ENEMIES OUT

On the left you can see trap-door spiders in the security of their burrows. The doors, neatly hinged and carefully bevelled to fit the openings, open at the slightest touch from below, and spring shut again when pressure is removed. On the right is a spider, safe in his hole, holding down the door so that his arch-enemy the centipede, cannot get in. Both are shown magnified

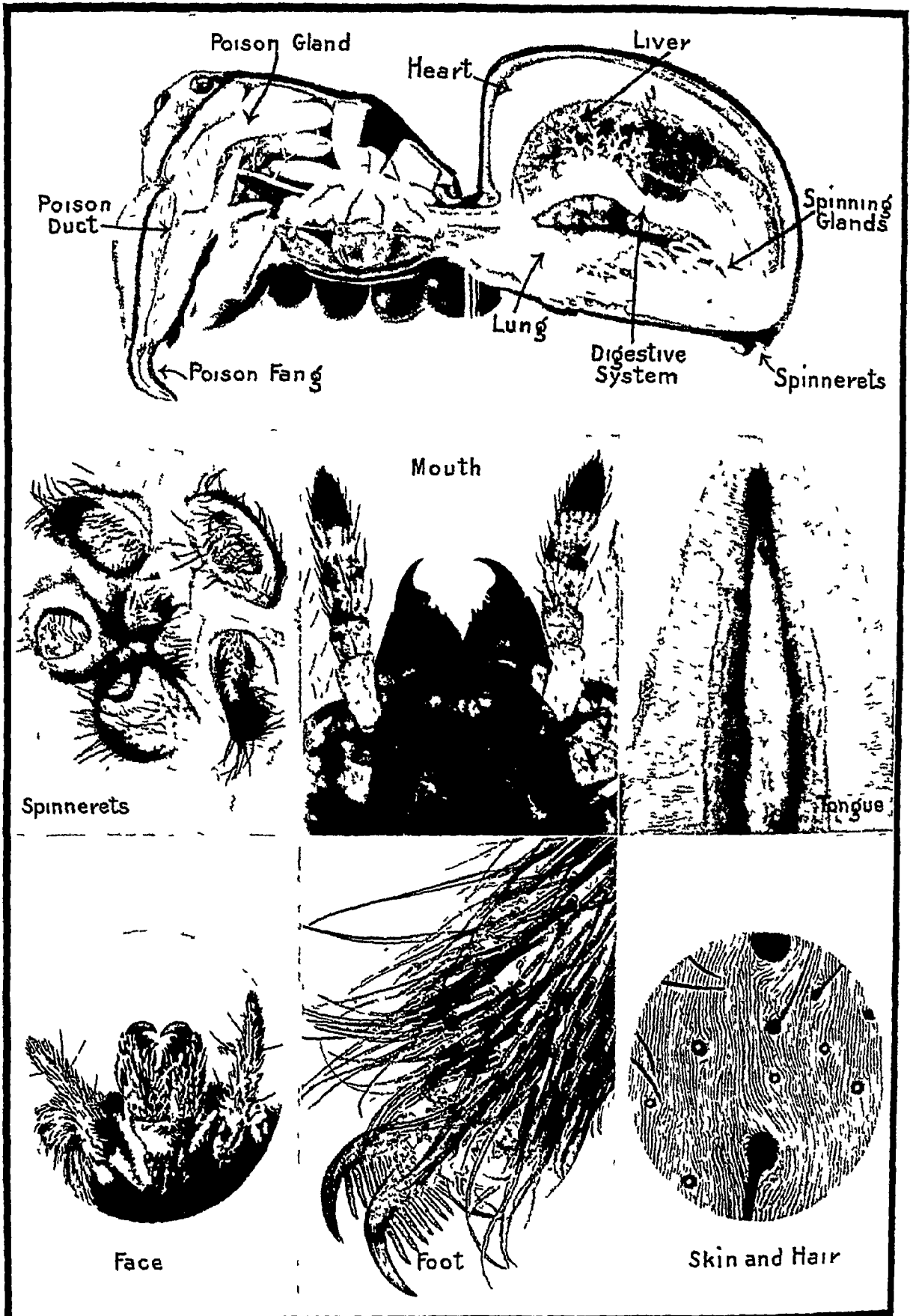
GIANT SPIDER WITH ITS HUMMING-BIRD PREY



Edward Step

Some of the giant members of the spider group, found in tropical regions, have earned the name of bird-eating spiders and here you see one of them at its horrid repast. Although birds are not actually the main items of their diet, these great creatures—sometimes as much as eight inches from leg-tip to leg tip—are able to catch birds by lying in wait just inside their holes (you can see one in the background of this picture) and then springing on the unsuspecting victim as it ventures just too near

STUDYING THE SPIDER WITH THE MICROSCOPE



All of the photographs on this page are many times magnified, so that you may see exactly how a spider is built. The noteworthy features of the internal structure are the poison ducts, which end in the curved claw (*chelicerae*) in front of the mouth, and the spinning glands, which terminate in the spinnerets. All that part of the head which is visible when the spider is seen directly from the front is called the face. The spider can swallow only liquid foods. After it wounds its prey with its sharp claws and kills it by the poison flowing from the duct in the under side of the claw, the spider sucks the victim dry, and casts aside the hard parts.

SPIDERS

silk The door may be a simple flap of silk and earth, or it may have the edges accurately bevelled to fit the opening, so that, when it is shut, one can not distinguish it from the surrounding earth. On the inner surface of the door are tiny holes and grooves, which receive the claws and jaws of the spider when it is holding the door closed against its enemies. These spiders lie in wait, with the door just propped open, and dart out to seize any passing prey they catch sight of.

The raft spider builds a tiny boat of leaves and twigs lashed together with its silken cables, launched on the surface of some pond. When he wishes to make a raid upon water insects, the bold skipper leaves the ship and runs out over the surface of the pool to catch them. Even more ingenious is the true water spider, which lives among the plants at the bottom of clear, quiet ponds. There it builds a thimble shaped dome of waterproof silk, fastened mouth downward to the stem of a plant or wedged in the crevice of a stone. Then it goes to the surface and catches air bubbles on its hairy body and carries them down, brushing them off into its cell until it is filled to the brim with air. To this home the water spider brings whatever prey it catches. Here, too, its eggs are laid and hatched (see series of pictures given in page 2879).

Long before the invention of balloons or aeroplanes, young spiders had solved the problem of aerial navigation. On a hot day the little spider climbs to the top of a bush or a fence post, or merely to the summit of a clod of earth. There it lifts up its abdomen and spins out a thread, which is carried upward by the air rising from the warm ground. Other threads are added to the first one, and perhaps spun together into a little fluffy cloud of gossamer. The breeze tugs



TALE OF A HUNTING SPIDER

The hunting spider carries its cocoon of eggs about with it (top photo) as it spins the nest in which it will be placed (centre). When the young spiders hatch (bottom) they burst the cocoon open and swarm out.

Photos J. J. Ward

at the aircraft, the spider lets go of the launching platform, hanging from its balloon by a slender thread, and away it sails, perhaps to travel for days before it comes to earth again. When it wants to descend, it spins out a drop-cord until it reaches the landing-place.

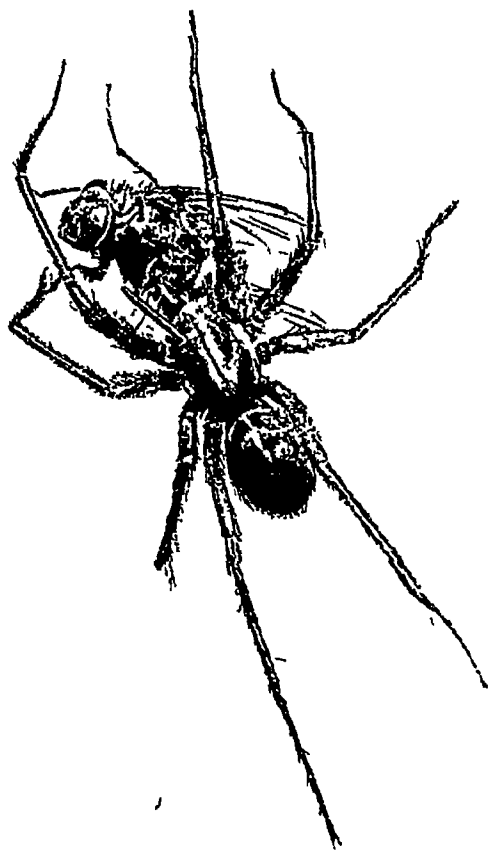
The safety devices and food getting tricks of spiders are endless in number. Certain crab-spiders (*Thomisidae*) hide in flowers and seize insects that come for honey. The wandering wolf spider (*Lycosa*) runs down his prey in an open race. It is to this family that the famous tarantula of southern Europe belongs. (See article on Tarantula.)

Male spiders are often much smaller than the females, and frequently brilliantly coloured, and in some species they perform the most extraordinary antics before the females, leaping and swaying and displaying their beauty. Usually these dancers remain at a safe distance, or approach with great caution, for if they fail to find favour they are likely to be pounced upon by the female and eaten.

Spiders vary greatly in shape and size. Some are no bigger than the head of a pin, while others, like the giant bird-eating spiders of South America, sometimes have bodies measuring up to 3 inches in length and legs expanding to 7 inches. These giants are hunters usually, leaping on their prey from a nest or burrow in a rotten tree trunk; they eat small mammals and reptiles as well as birds.

The difficulty of getting spiders to live peaceably together, as well as the almost impossible task of inducing them to spin freely in a confined space, has so far prevented the silk from being used on any extensive scale for manufacturing textiles.

Spiders belong to the order *Araneae* of the class *Arachnida*. The *Arachnida* in turn are



THE SPIDER AND THE FLY

One of the commonest members of the spider tribe is the house spider—that hairy, long-legged, dark brown fellow you may see on the ceiling or discover behind pictures. He is a useful spider, inasmuch as his prey consists chiefly of flies

included in the sub-kingdom of the *Arthropoda*, which also contains the insects, the crustaceans, the centipedes and the millipedes.

Spiders are not insects, for they have eight legs, all insects have only six. (See Insects) Also, the head and thorax of spiders are consolidated in one segment, called the *cephalothorax*, which is connected with the abdomen by a slender stalk. The number of eyes the spider has varies from two to eight, according to the species.

Spinning AND WEAVING One of the wonders of modern industry are the great textile mills, turning out miles and miles of beautiful fabrics, and the machines which they employ are marvels of inventive genius. Fundamentally cloth-making involves two processes—*spinning and weaving*. Both pro-

cesses had been discovered long before Man had learned to write and before recorded history began.

Spinning consists in drawing out and twisting the prepared fibres of flax, cotton, wool, or other materials, so as to form a thread or yarn suitable for weaving. Weaving, in turn, is the art of interlacing lengthwise yarns ("warp") with crosswise yarns ("weft" or "woof") so as to produce cloth.

For thousands of years the only means of spinning were the spindle and distaff. The prepared fibres were loosely bound to the end of the "distaff" (a short stick), which was held in the left hand or stuck in the spinner's belt. The notched end of the "spindle" was then caught in some of the fibres on the distaff; these were drawn out by the spinner's hands, and twisted into yarn by rotating the dangling spindle, a "whorl" of stone or clay being attached to its opposite end to assist this operation. When a yard of yarn was thus spun, it was wound about the shaft of the spindle and fastened, and the operation was repeated. Threads of wonderful fineness have been fashioned in this primitive way. The cobweb-like muslins of India were woven of thread so fine that 253 miles of it were spun from a single pound of cotton. The spindle used was of bamboo, about as long as a darning-needle, and lightly weighted with clay.

Later came the spinning-wheel. The principle of this is identical with that in spinning with the hand spindle, but the spindle is

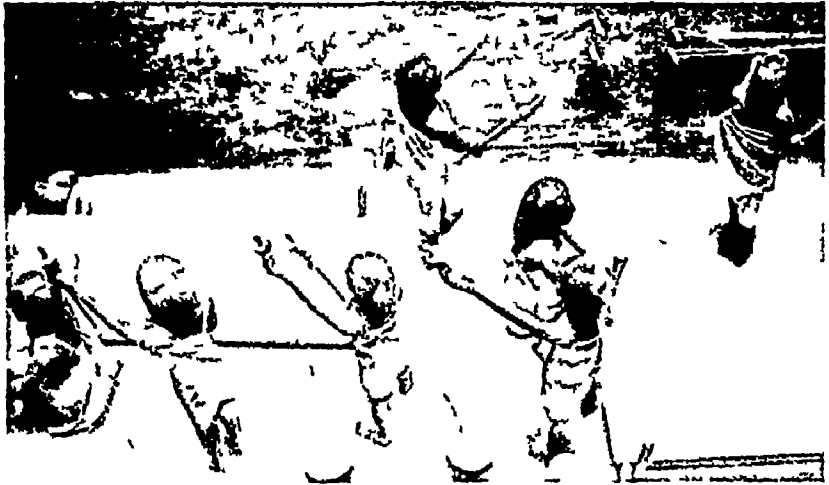


HAND LOOM WEAVERS AT WORK

Above are linen weavers working at a hand-loom in a Kincardineshire cottage. This is claimed to be the only establishment in Scotland still producing linen by hand-loom in the same manner as that prevailing a century ago. The weaver on the left has made pieces for the Queen.

SPINNING & WEAVING

mounted and given a uniform motion by being attached to a wheel. During the 18th century several notable inventions completely revolutionized spinning, by enabling the operator to spin many threads at the same time. (See Arkwright, Crompton, Hargreaves). Today great factories with power driven "mule spinners" and "ring spinners" enable a single operative to



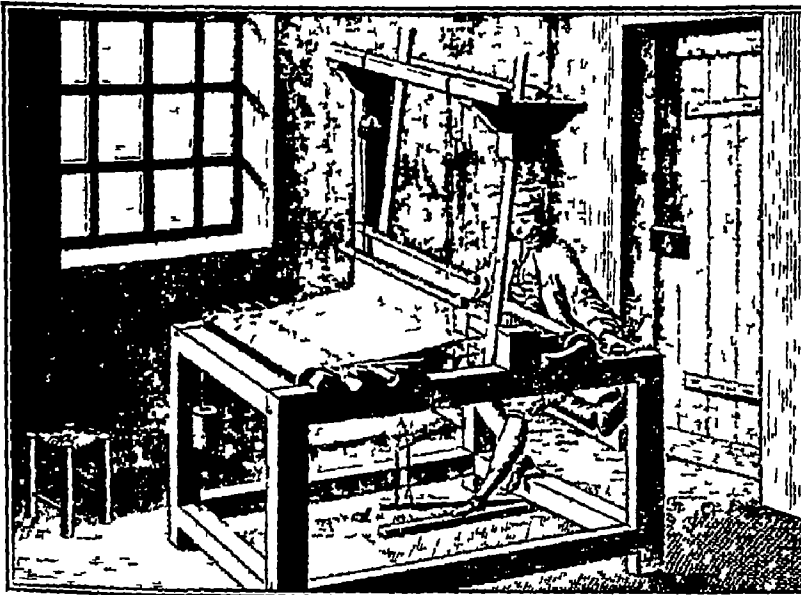
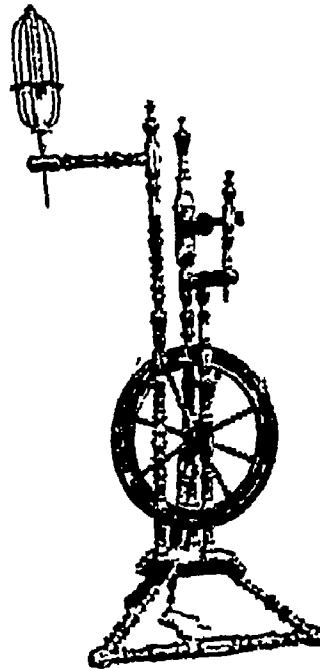
SPINNING BY HAND

- 1) Ancient models of Egyptian women spinning flax with distaffs, others are weaving linen cloth on flat looms
 - (2) Carding spinning and weaving in medieval times
 - (3) 18th century spinning-wheel of carved walnut
 - (4) Cotton weaver at his loom in a cottage in rural France (18th century)
- 1) Metropolitan Museum of Art (2) British Museum (3) Victoria & Albert Museum (4) from *Didrot's L'Encyclopédie*

spin more yarn or thread in a day than was possible with thousands of spinning wheels before 1750.

In weaving, the primitive hand looms of the most ancient days gradually became better built, but no notable improvement was made until the invention of Kay's "flying shuttle" in 1738. This was very useful in weaving wide cloths ("broadcloths"), for it returned of itself when thrown between the threads of the "warp" with its attached "weft," and did not require the services of a second person on the other side of the loom. It was not until 1785 that Cartwright (qv) patented the first power loom, from which all automatic looms developed.

Even before the days of the power loom, what is called the "Jacquard loom" was invented (named after a Frenchman who improved it) for figured weaving. (See Lace). It operated by means of a complicated system of perforated cards, which let through needles that raised and lowered the threads of the warp as was required.



SPINNING

to produce the elaborate designs of damask and other figured weaves. The essential principles of this machine remain in use in the highly specialized power-looms of today. Hand weaving is still sometimes employed for very fine materials, thus the velvet for the Coronation robes in 1937 was entirely hand-woven. Among the village industries which have been revived in recent years, hand-weaving is one of the most prosperous. (See Cloth, Cotton, Silk, Wool)

Spirits. The term "spirits" is generally used to describe alcoholic liquors above a certain strength which are obtained by the process of distillation. The name is thus applied to brandy, rum, whisky, and industrial alcohol.

In producing spirits, different materials are used, but the same general methods are followed. Thus, in making whisky, barley or rye or oats is used, or a mixture of these. This grain is left for about three weeks on the "malting" floor and allowed to germinate. It is then put into a huge tun and mashed up with hot water. At the end of the mashing process the mixture is cooled and fermented with yeast. One result of fermentation is the production of alcohol, this is separated by distillation, and thus whisky is procured.

Sugar-cane is the raw material used for fermentation in producing rum, and wine in producing brandy. For industrial alcohol, beetroot, potatoes, or even wood may be used.

The production of spirits is closely supervised in this country by the Excise authorities, and taxation upon spiritous liquors is one of the Government's main sources of income, yielding revenue amounting to over £30,000,000 a year.

Spiritualism. Can the spirits of the dead communicate with the living? The belief that they can and do has been widely held at all times and among all peoples. In modern times this belief has crystallized into an organized doctrine which we call spiritualism.

The modern spiritualist movement began in the United States in 1848, when members of a family named Fox, in New York State, U.S.A., reported that they heard in their house mysterious knocks, which conveyed messages through an alphabet system discovered by a daughter of the family. The messages purported to come from the spirit of a murdered pedlar. Kate Fox and her sister Margaret at once began interpreting messages from the "spirit world" and became the first "mediums," as those persons are called through whom the supposed spirits of the dead send messages.

Within a few years spiritualism spread to all parts of the United States and Europe. Mediums sprang up on all sides, and "séances" or spirit meetings multiplied. Besides the rapping noises, musical sounds were heard, tables moved, and mysterious lights appeared. The

SPONGES

mediums asserted that in the trance state they communicated with the spirits of the dead, and many persons received what they believed to be news from dead relatives. By 1880 the movement had grown large enough to attract the careful attention of scientists.

In 1882 the Society for Psychical Research was organized in England to investigate the facts of spiritualism. It was found in the first place that a great many mediums were frauds. Among mediums who could not be accused of deliberate trickery, the Society found a large number who excited themselves into a condition of ecstasy, during which they used unconscious deceptions upon themselves and others. (See on this the article on Hypnotism)

Is it Telepathy?

Some investigators suggest that the information received through mediums comes not from the spirits with whom they are supposed to be in contact, but by what is called telepathy or thought-transference.

But there still remains a considerable body of apparently genuine phenomena which has not yet been satisfactorily explained by any hypothesis generally accepted by serious workers in the field of psychology.

In Great Britain two famous men have been closely associated with spiritualism during the present century. They are Sir Oliver Lodge, the great scientist, and Sir Arthur Conan Doyle, the creator of Sherlock Holmes. After the death of his son, Raymond, in the World War, Sir Oliver Lodge became deeply interested in psychical research and wrote several volumes on the subject. Sir Arthur Conan Doyle also published his experiences.

Sponges. When you use the big, soft, bath room sponge, you probably never realize that you are washing with the home of countless little animals. Though sponges have been known for thousands of years, it was only about the middle of the 19th century that they were proved to be animals and not plants. Like plants, they are always fixed, and have no eyes or other sense organs, or legs, or any of the internal organs that we usually think of as belonging to animals. Yet they have the mode of feeding and development that belong to animals. And in other obscure ways they resemble animals and not plants.

Of course, this refers to *living* sponges. Your washing sponge is only the skeleton of a colony, in life it was all filled in and covered over with the soft, jelly-like flesh of living cells.

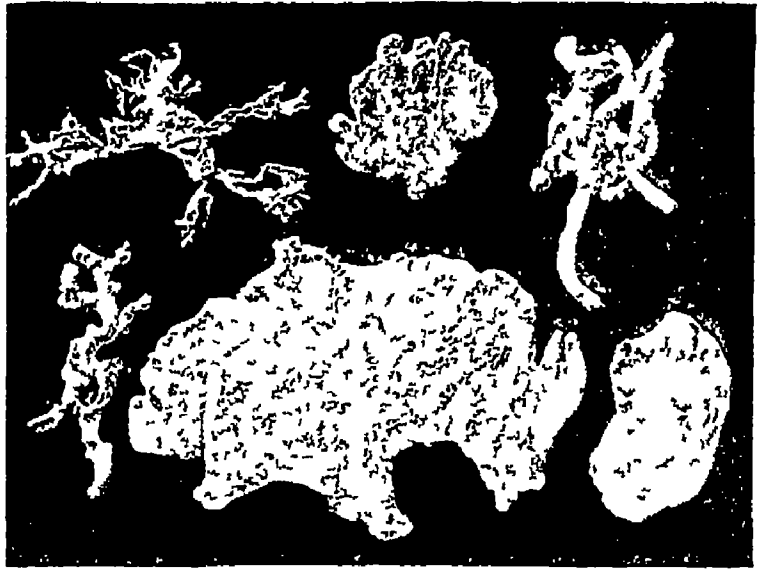
Most sponges are sea forms, but some inhabit fresh water. The marine forms live mostly in shallow water, down to a few hundred feet deep, though some live in the deepest seas. They are of many sizes and forms and colours. One is very simple, an inch or less in length,

SPONGES

and branching like a delicate piece of seaweed. Another is like a small vase half an inch long. Others still are in the form of big vases a foot or more in diameter. The wonderful "Venus's flower-basket" (*Euplectella*) is about the size and shape of a banana. Ordinary bath sponges, when living, have much the size and shape that we know from their skeletons, with the firmer, smooth end attached and the softer, round end free.

Some sponges live only attached to such animals as crabs, and some branching tube-like forms burrow into oyster shells and do great damage in oyster fisheries. Freshwater sponges live mostly on the under-sides of stones and floating objects, in ponds and slowly-flowing streams, sometimes they become a pest in reservoirs.

The skeletons of sponges are among their most interesting and important parts. In the ordinary bath sponges—which form really only one small group—the skeleton is of horn-like material and forms an intricate and complete meshwork of varying degrees of fineness. In others, the skeleton consists of needle-like rods



AUSTRALIAN SPONGES OF MANY SHAPES

The sponge fisheries of Western Australia are not yet of great commercial importance, but they supply all varieties from the smaller ones which look like seaweed or like a cluster of worms to the larger complex "glass" sponges

and fibres of limy material, interlocked in complicated ways. In others still, the fibres and rods are of flinty material.

A very simple type of sponge consists of a small narrow tube, attached at one end, with the outer or free end open. Innumerable invisible pores admit water to the chamber within



GIANT SPONGES FROM THE WEST COAST OF FLORIDA

These would make very rough bath sponges, but they are fine for washing windows, cleaning machinery, and other heavy work. They were only a small part of one day's "catch" delivered at Tarpon Springs, Florida, which is the greatest shipping point for sponges in the world. The Florida sponges are usually coarser and not so durable as those from the Mediterranean, but the Florida sponge fisheries are commercially much more important because their yield is much greater.

Peculiar small cells line the chamber, each with a lash which keeps the water moving in through the small and out through the large pores. This water contains oxygen for breathing, and also minute particles of food which are swirled into the cells to be digested.

In large sponges millions of pores admit the water to intricate systems of branched canals on the inside, which have tiny chambers lined with the feeding cells. The canals lead like flues to the larger chimney-like openings and so to the outside. It is these large holes that we usually see in ordinary sponges.

Sponges, then, are not single animals but "colonies." The original very small single

handled fork. They are easily prepared for the market. When put into water and allowed to stand, the flesh soon decays away, and the skeletons are readily washed out and cleaned.

Sponges as a whole form a division of the animal kingdom called the *Porifera*.

Spring. When water which has sunk into the ground issues from beneath the surface through a natural opening in sufficient quantity to make a distinct current, it is called a spring.

In general, springs are due to the accumulation of water underground by a layer of impervious rock. In such cases the water must find some outlet, which may occur in a valley or upon a hillside—in a valley, where such a valley dips into the underground water, and on a hillside, where the water runs along the slope of a bed of rock or clay to the place where the bed "outcrops" or comes to the surface.

When the water is forced up under pressure it is called an artesian spring. Artesian wells, so called from Artois, in France, where such a well was first sunk, are merely deepened, artificially assisted springs. (See Artesian Wells) Springs that rise from a great depth are generally permanent, but many springs are intermittent.

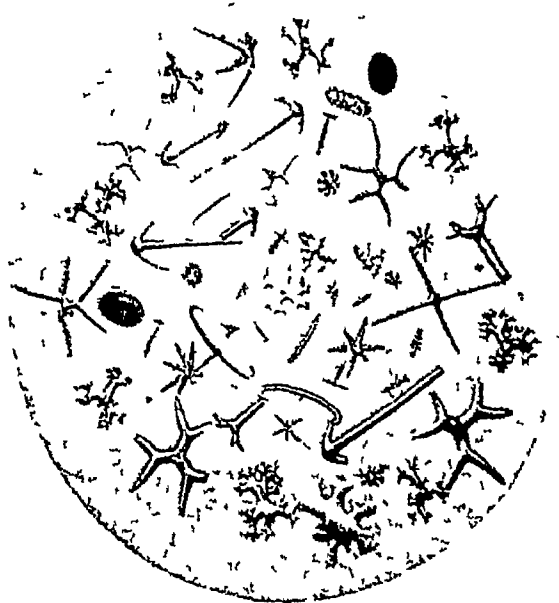
Mineral springs (*qv*) often become health resorts and fashionable "watering places," such as Spa, in Belgium (where the use of the name "spa" for such a resort originated), Baden, in Germany, Karlsbad (Vary Karlovy), Czechoslovakia, Bath, England, and Saratoga Springs in New York State, U.S.A.

When hot springs occur far from any volcano, it is probable that the waters have sunk deep into the interior of the earth, have there been warmed by the earth's internal heat, and then brought again to the surface by what is called "hydrostatic pressure." A hot spring which throws forth columns of water and steam is called a "geyser" (See Geyser).

Spruce. Spruces are the real "Christmas trees," and as such are known to children all over the northern parts of Europe. Widely distributed in northern Europe and America, they are distinguished from the firs in having curved needles set all round the smaller branches instead of in flat rows, and in having hanging instead of erect cones.

The finest of all European spruces is the Norway spruce (*Picea excelsa*), a magnificent tree attaining a height of 80 to 150 feet. In Britain it is an ornamental as well as a timber tree.

Spruce timber is highly valued in shipbuilding, for it affords the finest masts and spars in the world, combining strength, lightness, and elasticity in unusual degree. Spruce is also the chief wood from which paper pulp is made. It is used for aeroplane construction, because it is not merely the toughest of soft woods for its weight, but possesses great shock-



SPONGE SPICULES

H. Bostin

Seen under the microscope, a piece of sponge is hardly recognizable, for it is found to consist of a mass of "spicules" or little jagged crystals. Here is seen a selection of variously-shaped spicules, dissolved out of many different kinds of sponge, for each kind has differently-shaped spicules.

sponge was developed from a very small egg cell, a thousandth of an inch in diameter. The egg hatched into a very small creature, which swam about free for a short time and then settled down for life and proceeded to grow. Later it budded new individuals from itself until the sponge was built up. The sponges of commerce are found chiefly in the Mediterranean as well as off the coasts of Florida and the West Indies. From the eastern Mediterranean come the finest toilet sponges (*Euspongia*), such as the Turkey cup-sponge. The hard or Zimocca sponges are obtained from the Mediterranean and the West Indies, and the common or horse sponges (*Hippospongia*) from all three localities. Of the Florida species the sheep's-wool sponge is very plentiful. (See illus. page 392)

All sorts are obtained by diving, dredging, and (in very shallow water) by means of a long-

SPRUCE



A SPRUCE 'CHRISTMAS TREE'

The name spruce describes this tree's appearance and that it is well-suited to it this picture shows. It is a straight soldierly-looking tree with plenty of rich green needles along its slender branches. In older trees these droop considerably

absorbing qualities. The chief American species is the Sitka spruce (*P. sitchensis*) which is also planted now in Britain. It likes a damp climate and grows very rapidly, it is stiffer than the Norway spruce, with greener needles.

Squash Rackets. One of the most popular games at the present time is known as "squash." It is very strenuous, half an hour's play usually being ample, and provides excellent, concentrated exercise. The game is played in a small court with four walls and a wooden floor, illuminated by powerful electric lights. The general idea of the game is the same as in "fives" (*qv*), the object of each of the two players being to score a point by striking the ball with the small, long handled racket either before it reaches the ground or on the first bounce in such a way that his adversary is unable to return it correctly and so loses the stroke.

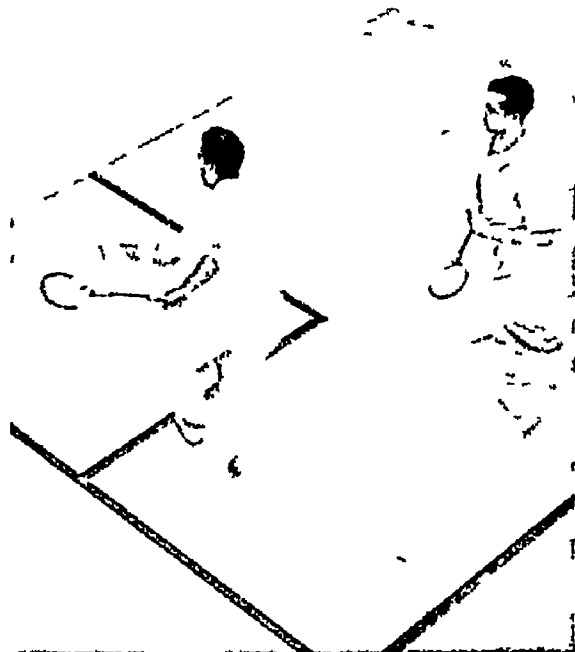
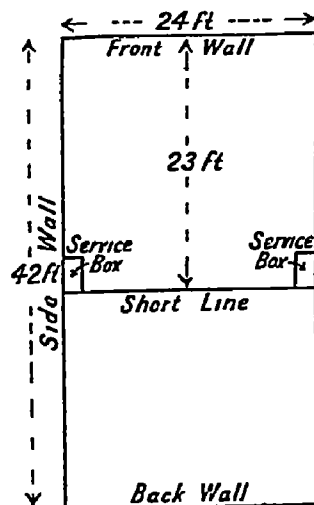
The server must stand with at least one foot in the service "box," and serve in such a way that the ball (it is a small, black, rubber sphere) strikes the front wall of the court above the "service line" and falls within the service court in which his opponent is standing. As in

SQUASH

lawn tennis, two services are normally allowed, and if both are faults the server must give the service to his opponent. The services are delivered from the two boxes alternately. When the ball is in play, the rally continues until one or the other fails to make a good return. During a rally the ball may hit any of the other walls before it hits the front one, and any part of them except the metal edges. Game consists of nine points, only the server scoring.

Squash requires a very good eye, a strong wrist, very accurate judgement, and great activity. The greatest player that the game has ever seen—F. D. Amr Bey, the Egyptian—possessed these attributes to a superlative degree. It is always advisable to stand well back in the court as it is easier to run forwards than backwards.

Rackets is similar in essential to "squash," but is played in a much larger court.



STRENUOUS 'SQUASH'

Here is D. G. Butcher in play during the final of the Professional Squash Rackets Championships at Lansdowne House Club, London. The diagram above shows the lay out of a squash rackets court.

SQUIRREL

The PRETTY WAYS of the SQUIRREL

The red squirrel is one of the most popular of our wild creatures. With rather different feelings is viewed the grey squirrel—which is a decided pest. Did you know that squirrels belong to the same group as rats?

Squirrel. Wherever he is, this is one of the most popular of creatures, for he is not shy and is as pretty and cheeky as you could wish. Some member of his family, which belongs to the order of rodents, may be found in almost every part of the world, except Australia and Madagascar.

The "red" squirrel (*Sciurus vulgaris*), which occurs throughout Europe and Northern Asia,



varies greatly in colour in different localities. In northern and western Europe squirrels are bright reddish-brown, like those of our English woodlands, in the mountains of southern Europe they are greyish-black, and in Siberia and Russia they are pale grey (it is the skins of this grey squirrel that are in such demand for fur).

Squirrels live in trees and leap from bough to bough with extraordinary agility. Their nests, called "dreys," are made of leaves and moss, and are built in the branches of trees or in hollow trunks. Their food consists chiefly of pine cones, nuts, acorns, fruits, and fungi, but they occasionally eat birds' eggs. They always sit up on their haunches to eat, holding their food in their front paws. The grey squirrels (*S. cinereus*) that you see in the parks of London and in other districts were introduced from North America and have become a real pest, for they eat young birds in numbers and also drive out the weaker red squirrels wherever they spread. Efforts are being made to kill them off.

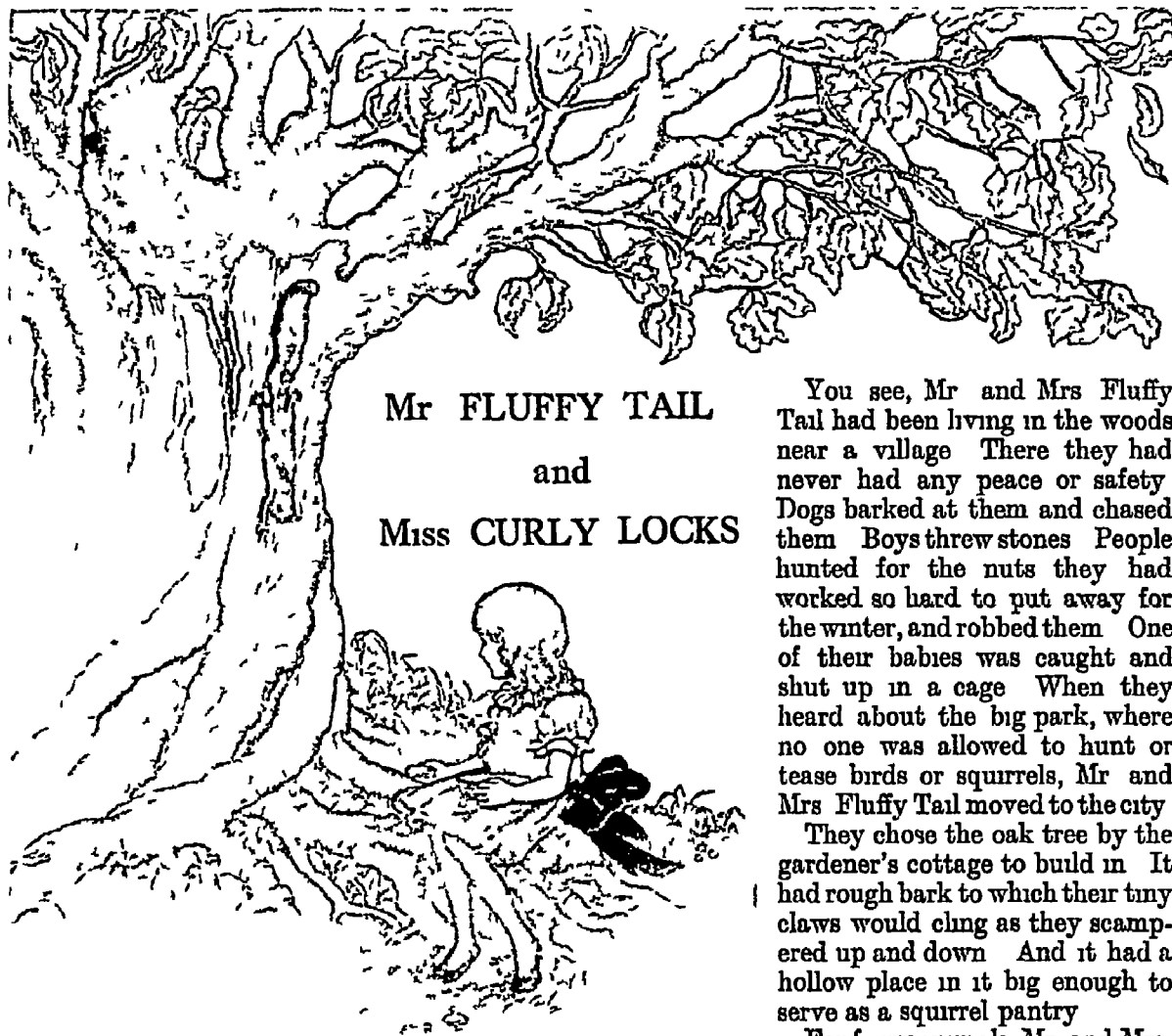
The most extraordinary of all the squirrels are the flying squirrels, which have a peculiar extension of skin connecting the fore and hind legs. This is loose and can be drawn out when the legs are extended, so as to form a parachute.



AN ENGLISH RED SQUIRREL AND THREE OF HIS CANADIAN COUSINS

The squirrel is always a favourite, for few creatures are so tame and so willing to "show off" before their human friends. The upper photograph shows an English red squirrel—a member of our only native species—seated in characteristic pose on a tree-stump, having a meal of nuts. His tail is neatly curled over his head. The three youngsters in the lower photo have not learnt the art of walking along a branch, and their tails are hanging down instead of being used as balancers.

Top photo J. Kearton



Mr FLUFFY TAIL
and
Miss CURLY LOCKS

You see, Mr and Mrs Fluffy Tail had been living in the woods near a village. There they had never had any peace or safety. Dogs barked at them and chased them. Boys threw stones. People hunted for the nuts they had worked so hard to put away for the winter, and robbed them. One of their babies was caught and shut up in a cage. When they heard about the big park, where no one was allowed to hunt or tease birds or squirrels, Mr and Mrs Fluffy Tail moved to the city.

They chose the oak tree by the gardener's cottage to build in. It had rough bark to which their tiny claws would cling as they scampered up and down. And it had a hollow place in it big enough to serve as a squirrel pantry.

For furry animals, Mr and Mrs Fluffy Tail built the oddest house. It was set high up, in a fork of the tree, and was woven of moss, twigs, dry leaves, and feathers, like a bird's nest. And they had to hurry to get their nest ready for babies. Every summer, from three to five little Fluffy Tails were born there.

They were very much alarmed at first when they found that they had another neighbour in little Miss Curly Locks. Sometimes, when she came out to play, they were very careful to run up and down the other side of the tree. Sometimes they dropped from a high limb. They were never hurt. They always came down on their feet, right side up, like little kittens. A little later they grew bolder and leaped over her head.

"Oh, you darling little dears! Don't be afraid of me. I wouldn't hurt you for anything." She flung a handful of nuts to them. They sat up on their hind legs and looked longingly at the good food, but they would not touch it. The nuts were gone the next morning, and Curly Locks was so glad that she clapped her hands. By and by the wild little things would learn to trust her and be friendly.

That time came very quickly. In the early summer there was not much in that clean city

THE very first time that Curly Locks saw Mr Fluffy Tail, he was sitting up on his hind legs, eating an acorn. He was a little grey squirrel, only 10 inches long. Really he was a warm sunny grey, for there was quite a bit of brownish yellow in his pretty coat. His tail arched like a plume over his humped-up back.

He chattered shrilly in great alarm when he saw Curly Locks, and he dashed up a tree. His tail waved behind him like a gallant little banner. He was gone so quickly that he might have been a wood fairy.

Curly Locks was the luckiest little girl! Her daddy was head gardener of a big city park. So she lived right in the park, in a grey-stone and brown wood and red-tile roofed cottage. A gnarly old oak tree shaded the cottage. Curly Locks liked the shade of the oak tree when the sun was hot. Every day she brought her dolls out, to play on the grass. That is how she knew when a pair of squirrels built a nest in the oak tree. When she was playing under the tree, Mr and Mrs Fluffy Tail had to pass her every time they ran up and down stairs. They were such wild, frightened little things that it was days and days before they would come near her.

SQUIRREL

park for squirrels to eat, for old acorns and nuts were raked away by the gardeners. Mr and Mrs Fluffy Tail nibbled tender shoots and twigs, and ate winged maple seeds. Sometimes they found maize and oats by the duck pond, but the ducks quacked and scolded so loud that they were frightened away. Very often they would have gone hungry but for little Miss Curly Locks. She nearly always had something for them to eat.

By and by they were sure it was quite safe for them to sit up and eat the food when she was there. Mr Fluffy Tail picked up a nut with his fore-paws. Then he sat up on his hind-legs and ate it. His fore-paws were like little hands, with four fingers and a thumb. His hind-paws were feet, with five toes. He held the nut with both hands. He cracked it with his strong teeth. Then he picked out the kernel and popped it into his mouth.

When he had had enough to eat for one meal, he carried the rest of the nuts away and buried them under the bushes. He carried the nuts in cheek pouches, in his mouth. Two nuts in the pouches made Mr Fluffy Tail look as though he had mumps. He buried each

nut in a different place, and scratched the earth over it. Then, when he was hungry, he just dug up a lunch.

Mr and Mrs Fluffy Tail became so friendly with Curly Locks that they often asked her for food. They came within a few feet of her, and, rising on their hind-legs, they begged like little dogs. When they did that she threw two nuts to them. If they wanted more they had to beg for them. Every day they came nearer. At last they took food from her hands. After that they were never afraid. They even leaped on to her shoulder and hunted for nuts in her pocket and her hat.

The Babies Come Down to Earth

It was a happy day when they brought five teeny-weeny, fluffy-tailed babies down the tree to see their little girl friend. They all played games. They chased one another up and down and round the tree. They ran races across the grass, and the baby squirrels learned to crack nuts. They helped themselves from the dollies' tea-table. Every sunny day Curly Locks watched the little family at their frolics. Soon she watched them flying about their task of getting in food for winter, and storing it away.

Autumn had come, with wind and rain and frost. The air was full of red and yellow leaves. Acorns, nuts, and fir cones lay on the ground. Even the baby squirrels were busy gathering nuts. Filling their cheek pouches, they scampered up the tree to the deep hole near the nest. It took many days of hard work to fill it.

Then they had to gather twigs and moss and dead leaves, and feathers dropped by birds, to weave a roof over the nest. That was to keep out rain and snow. A door was left, just big enough to squeeze through. Curly Locks noticed that the Fluffy Tails were growing winter overcoats. Their fur grew long and thick to keep them warm.

When winter came she did not see much of her furry friends. They slept a good deal of the time. Sometimes, on bright days, they came down the tree for a frolic. They left their tiny footprints in the snow. Curly Locks often pressed her nose against the cold window-pane and looked up at the snow-covered nest in the leafless tree.



C. W. R. Knight

GREY SQUIRREL, ATTRACTIVE BUT UNPOPULAR

This is the grey squirrel, established in Britain for many years now, but not at all popular with those who know our countryside. This is because it is slowly but surely exterminating our native red squirrel (see page 3820), and, moreover, is also a slayer of small song birds and other members of our native fauna. Once common in London parks, it has been more or less wiped out there in an effort to preserve our bird-life.

"Oh mummy," she said, "just see how their poor little house rocks in the wind. The Fluffy Tails must be nearly frozen."

They were not. Indeed, they were as snug as could be. When the weather was so cold that their paws might be nipped, they scampered into their pantry and went to sleep.

One day Curly Locks had such a happy thought that she clapped her hands. On a sunny window sill she put a dish of nuts. The squirrels came flying down the tree. They sat upon the snow and sniffed, wrinkling their funny little noses. In another minute they were up on the window sill enjoying the feast. After that they came whenever they were invited. But they never stayed long.

Then spring came, as it does every year. The nest was crowded now, for the Fluffy Tail babies were quite grown up. So they tumbled out and built nests for themselves.

Mr and Mrs Fluffy Tail stayed in the old home. They had lived together a long time, and were too fond of each other ever to part. By midsummer the nest was full of new babies. Curly Locks could hardly wait to see them. One day when she was having a tea party for her dolches under the tree, the whole family raced down and invited themselves to the feast. Mr and Mrs Fluffy Tail showed their children just how to behave at a party. They sat up like little dogs and begged for food so nicely.

"And that," said Curly Locks, "was the nicest surprise party I ever had."

Staffa, SCOTLAND This uninhabited volcanic island of the Inner Hebrides, 7 miles from Mull, is an egg shaped tableland about $\frac{3}{4}$ mile long, $\frac{1}{2}$ mile wide and 71 acres in area. In the north east there is a shelving shore, but otherwise the coast has formidable cliffs with numerous caves, the faces and walls of which in most cases are formed of colonnades of basaltic pillars, Staffa being the Scandinavian word for 'pillar island'.

The most remarkable cave is Fingal's Cave, which was discovered in 1772 by Sir Joseph Banks, and is Scotland's nearest approach to Ireland's famous Giant's Causeway. The cave is 227 feet long, 42 feet wide, and 66 feet high. The entrance is an arch supported by basalt columns, and from the entrance to the end of the cave is a pavement of broken columns.

The tints of the colonnade of broken pillars, flecked with the pure white of lime, the greens and golds of seaweed and lichens, and the green of the sea floor make an enchanting picture. Sea birds and seals are the sole inhabitants.

Other caves are the Scallop or Clamshell Cave, the Boat Cave, and Mackinnon's or Cormorants' Cave. Not far from the Scallop Cave is a rock shaped like a shepherd's cap, well known locally as "the Herdsman."



Fred W. Hardie

CAVE OF COLUMNS IN STAFFA

Fingal's Cave, at the southern extremity of the isle of Staffa—the Isle of Columns—is world famous. The symmetry of the multitude of basalt pillars ranged along the front and sides is astonishing, and the cave is remarkable for its lovely stalactites.

Staffordshire, ENGLISH COUNTY This western midland county has an area of 1,158 miles. Its surface is low or undulating except in the north where the Pennines enter it. In the centre of the county another stretch of high ground is Cannock Chase, once a royal hunting ground, now a coalfield.

The chief river, the Trent, the third longest in England, rises in the county. In the north of Staffordshire are the Potteries, the centre of the English china and pottery industry, which is carried on in the "Five Towns" of Tunstall, Burslem, Hanley, Stoke upon-Trent, and Longton—now forming the county borough of Stoke. In the south of the county is a part of the Black Country, which extends also into Warwickshire, with its coalfields and iron and steel works. Elsewhere the county is agricultural, cattle rearing, dairy farming, and the cultivation of wheat, barley, and oats being carried on.

The county town, Stafford, is an important railway centre, and also has boot and shoe factories, and engineering works, while salt is made from a brine spring in the district. Stafford has been a borough since 1200, and

the beautiful cruciform 12th-century church of St Mary is its chief glory. Stafford Castle occupies the site of a Norman stronghold. The town has a population of about 30,000, but there are many industrial centres within the county that are more populous, including in the north the "Five Towns," and in the south Wolverhampton, Walsall, Smethwick, West Bromwich, and Wednesbury. Burton-on-Trent (*qv*) in the extreme east of the county is the most important brewery centre in England. Coming to Lichfield, its Cathedral is perhaps the most beautiful of the smaller English cathedrals, and the town has also Staffordshire's most interesting literary associations (*See* Lichfield, and *illus p 874*). Izaak Walton was born in Stafford. Arnold Bennett was born near Hanley, and the scene of his most important novels is laid in the Potteries. Francis Brett Young is a more recent novelist of Staffordshire life.

The population of the county of Staffs is about 1,450,000.

Stalin, JOSEF VISSARIONOVITCH (born 1879). On December 21, 1879, a son was born to the wife of a poor peasant of Gort in Georgia, named Djugashvili. He was named Josef, and his early life was one of hardship. In his youth he became a rebel against the Tsarist regime, and as he grew older his political activities began to be noticed by the police, in 1902, as a member of the Social Democratic Party, he was arrested and exiled to Siberia. Until the Revolution of 1917 he was constantly being arrested and escaping again. Before the Revolution came Josef Djugashvili had changed his name to Stalin, meaning "man of steel"—a title bestowed on him by Lenin (*qv*).

He became a member of the Bolshevik Central Committee and editor of the newspaper, "Pravda," which later became the chief Government organ. When the Bolsheviks gained power, Stalin served against the "White" Russians, who were attempting to overthrow the Revolutionary Government, and the Poles. After the campaign he became Inspector-General

for Fields and Factories, and a member of the Revolutionary Military Council, 1920-1923.

Then began a long struggle for supremacy between Stalin and Trotsky, who was second only to Lenin in the Bolshevik Government. After the death of Lenin, Stalin gradually obtained the ascendancy, and in 1927 he succeeded in overthrowing Trotsky and all other possible rivals and establishing himself in supreme power. Stalin, as Secretary-General of the Communist Party, now introduced his first Five-Year Plan, which was to make Russia self-supporting, industrially as well as agriculturally. By the aid of foreign capital and foreign technicians, huge factories and engineering works were built in many parts of the country, hydro-electric plant was installed to supply power, and towns sprang up in the new industrial areas.

In 1931 Stalin found it necessary to modify the strictly Communist principles which underlay the Five-Year Plan and he introduced certain modifications providing for greater individual responsibility, and for reward in proportion to services rendered. In addition he provided for the mass transference of peasants to industrial occupations, and offered opportunities for technicians who had fled from Russia at the downfall of the Tsarist regime to return to their old



A SMILE FROM STALIN

J V Stalin, virtual dictator of the Soviet Union, is here seen chatting to a little schoolgirl from a farm in the Stalinabad district of Tajikistan, in Russian Central Asia. Stalin's name means "man of steel," but this photograph shows that he can unbend at times!

occupations in the new country he was building.

The success or failure of the Five-Year Plan and of the further Plans which were launched in 1933 and 1937 cannot yet be judged, but there is no doubt that Stalin showed remarkable vision and powers of organization. His efforts to create a new Russia met their chief obstacle in the inherent unwillingness of the peasants to turn from an agricultural to an industrial life.

After his accession to power Stalin ruthlessly crushed all opposition to his rule, and those suspected of opposing it were brought to trial and sentenced to death by dozens at a time.

Stalin was the author of the New Constitution of 1936, and his writings include "Leninism," of which an English edition appeared in 1928.

The ROMANCE of the POSTAGE-STAMP

The fascination of stamp collecting needs no explanation, but its value as a source of education and information is sometimes forgotten, for stamps we learn geography and history in the most interesting way possible

Stamps AND STAMP-COLLECTING Stamp-collecting, or philately, is a favourite hobby in all lands and an important trade in many countries. It owes its charms to the immense variety of stamps in existence, the diversity of their designs, and the glimpses that they bring us of peoples and places all over the wide world. Even in its most elementary stages it has an educative value, in



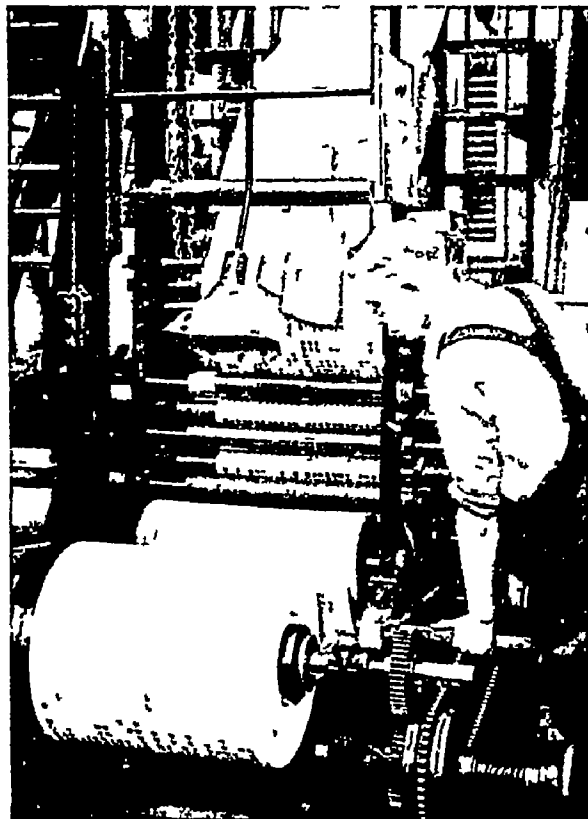
creasing one's knowledge of geography and history, while in its commercial aspect there is always the probability of one's stamps increasing in value, and of a rare specimen being discovered. The rarest stamps in the world

(see illustration under Mauritius, page 2682) are worth a fortune.

The postage stamp, as we know it, is not a thing of great antiquity. It was introduced into Great Britain in 1840, at the suggestion of Sir Rowland Hill, and, small as it is, this little piece of paper worked one of the wonders of the civilized world. It used to be a very costly matter to get letters by post in the old days, and instead of receiving them free, as you do today, you had to pay the postage to the postman on delivery.

Just imagine what a lot of time and trouble there would be if our postmen had to wait at the door to collect the halfpennies and pennies on all the letters, postcards, papers and parcels, to say nothing of the extra work at the post offices, to keep accounts of all the moneys collected.

All that bother was simplified by issuing the little postage stamps which you can buy at any post office and use to prepay the postage.



STAMPS BY THE THOUSAND BEING PRINTED AND PACKED

English postage-stamps are now printed by the photogravure process, and on the left you can see how the sheets of printed stamps flow endlessly from the presses. The ink used is tested at frequent intervals for colour and fastness. On the right, in the Dispatch Section at Somerset House, London, sheets of newly-printed stamps are being checked and made up into parcels for distribution to the various post offices. Every year over seven thousand million stamps are issued by the Post Office.

By courtesy of H M Postmaster-General

STAMPS & STAMP-COLLECTING

The date for the issue of the one penny black was fixed for the 6th of May 1840. Though the stamps were circulated several days before the time appointed for their use there were eleven plates used. Nos 1 to 11, the stamps were printed in sheets of 240 (rows of twelve).



Mr. Donegan

5 Pembroke Quay

Dublin

Plate XI

Guide lines in NE square of all four stamps

Plate XI



A PAGE FROM A SPECIALIST'S STAMP ALBUM

Here is a page from a specialist's collection of postage-stamps of Great Britain, actually showing the original "penny black," the first of all true postage-stamps. At the top are three "mint" specimens—that is, unused stamps with complete gum on the back, then one stamp on a "cover," as the envelope is called, then single specimens showing post-marks, with a fine "strip" of four stamps. At the top are written details of the issue, watermark, and plate numbers, etc. Thus the page tells the history of the stamps thereon.

Courtesy of F. H. Vallancey

The stamp is like a magic talisman. Stick it on the letter, drop the letter in the pillar-box, and it is carried off to whatever place you wish it to go. The stamp shows that the Post Office has received its due payment.

The idea of using stamps to prepay postage caught on at once in England, but it was some years before it began to be realized abroad that the system was deserving of universal adoption. The United States did not issue stamps until 1847, France and Germany (Bavaria) not until 1849. But, beginning with the 'fifties, the stamp system began to spread rapidly throughout Europe and the British Empire, and now there is no civilized nation and no organized colony that does not issue postage-stamps.

The first postage-stamps of Great Britain, issued in 1840 (illustrated on the left), bore a portrait of the then young Queen Victoria. Why did they bear a portrait? There were several reasons, but the most important was because a familiar face offers a safeguard against forgery. If the tiny stamps could be printed by anybody, some unscrupulous people might print them and use them to defraud the Post Office. Now, by using the portrait of the Queen, which everyone soon got to know, it was realized that if anyone tried to forge the stamps, a line missing or defective in the forgery would in some degree alter the expression, and our eyes are trained to notice the slightest alteration in a familiar face.

During her long reign Queen Victoria's portrait appeared, not always so prettily engraved, on just over 3,000 different stamp issues of Great Britain and the Colonies. After

her death the portrait of King Edward VII, and later that of King George V, appeared on most stamps of the British Empire. In 1935 over 200 varieties were issued to commemorate the Silver Jubilee, in 1936 stamps bearing the head of King Edward VIII were issued, and in the following year came the George VI stamps, including the special Coronation issue.

Many other countries followed our example in using portraits for their stamp designs, but some have studies of natives, local scenery, birds, beasts and fishes, heraldic emblems, and even mythological subjects. As you turn the pages of your stamp album you traverse continents with giant strides and everywhere get glimpses of the life and customs of the

people History, too, is portrayed in these little pieces of paper, for wars and revolutions, and even changes of government, produce their provisionals, their surcharges (in which the value of the stamp is altered), or their overprints (when there is a new legend printed on the stamp)

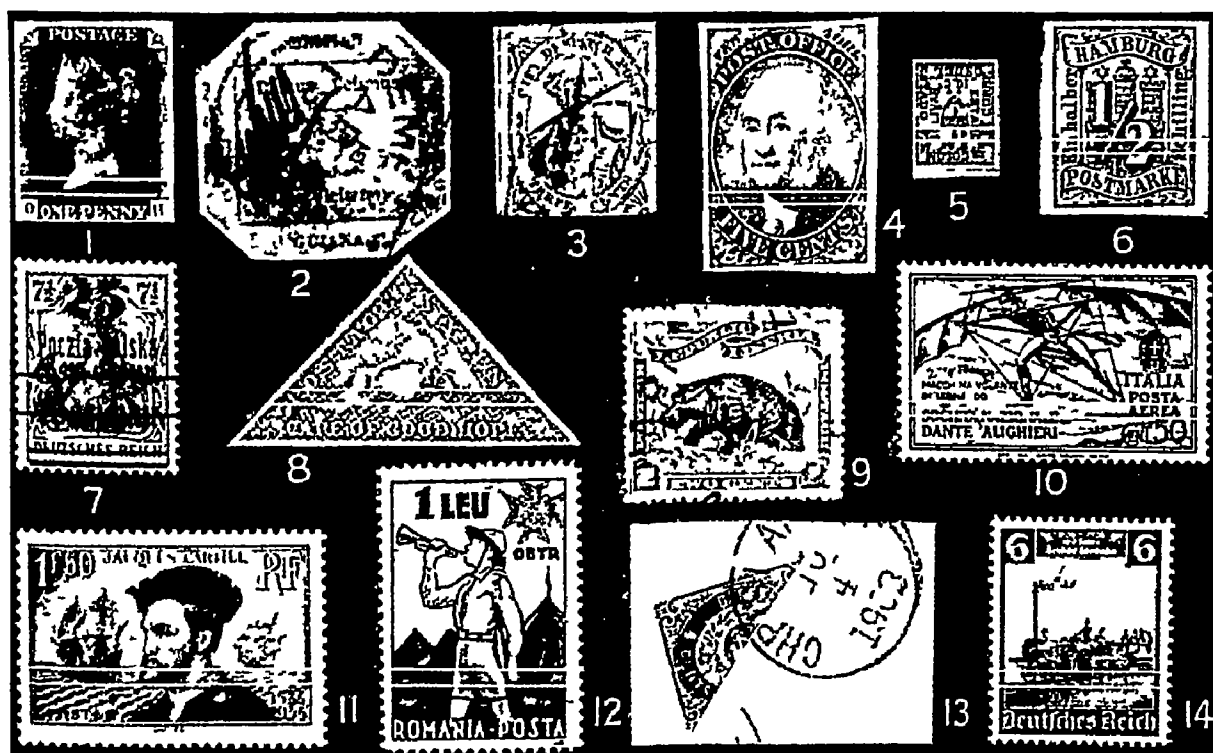
Stamp collecting, to be worth while, must be pursued with due regard to the condition of the stamps and the method and neatness of arranging them. You should not put dirty or damaged specimens into the album at all, because one black sheep will spoil the appearance of a whole page of stamps. The stamps should be mounted in the album with specially prepared hinges made of gummed paper, and should only be handled with stamp tweezers. Never tear a stamp haphazard off an envelope, but soak it off carefully.

The more advanced philatelist needs other apparatus, such as a magnifying glass, in order to study variations of perforation, colouring, watermark, and so on. An unused or a "mint" stamp is usually worth more than a used one of the same issue and denomination but this rule is by no means without exception:

The wise collector, once he has amassed a good sized collection, concentrates on some class of stamps that appeals to him, he does not attempt to spread his collection over the whole of the philatelic field. Clean or lightly marked stamps in perfect condition are more to be desired than mere numbers. Moreover, a stamp collection of any pretensions should always include with every series that is at all fully represented a neatly written history or other description. The collector must know his stamps, or half his pleasure is lost. Such a collection should be mounted in a loose-leaf album, whose pages can be added to or rearranged at will, and its compilation and arrangement entail the use of a catalogue or even a monograph on the specialized subject. A popular development in specialized collecting is air mail philately. "Flown covers" sent by air on a "first flight" or on some record-breaking journey are often quite valuable.

Stanley, Sir Henry Morton (1841-1904)

'The river was calm, and broad and brown. Armies of parrots screamed overhead as they flew across the river, legions of monkeys spotted in the branchy depths, howling baboons



SOME PHILATELIC PRIZES: ARE THEY IN YOUR COLLECTION?

Here are some of the stamps that collectors covet: (1) the first adhesive stamp the "penny black" of Great Britain, used in 1840, (2) the famous 1-cent British Guiana rarity, only one of which is known and which once changed hands for £6,500, (3) the City Despatch Post stamp, issued in New York in 1842, (4) the New York Postmaster stamp of 1845 the forerunner of the United States stamps, (5) the smallest individual stamp, issued in Bolivar, Colombia, in 1863, (6) heraldry the arms of the free city of Hamburg on a stamp issued before the city was included in the German Empire, (7) a German stamp overprinted for use in Poland in 1916 and overprinted and surcharged by the new Polish government in 1918, (8) the Cape of Good Hope triangular stamp of 1853 one of the most popular stamps of the 19th century, (9) animal life on a stamp of Liberia, (10) invention Leonardo da Vinci's flying machine shown on an Italian stamp, (11) exploration a French stamp in honour of Jacques Cartier, (12) Boy Scout on a stamp of Rumania, (13) a 'bisect' half of a 4-cent stamp used as 2 cents, Danish West Indies, (14) transport shown on a stamp of Germany. The stamps above are all either cancelled or defaced in compliance with the laws which require that illustrations of stamps in philatelic and historical articles shall be so defaced.

STANLEY

alarmed the solitudes, crocodiles haunted the sandy points and islets, herds of hippopotami grunted thunderously at our approach, elephants bathed their sides by the margin of the river, there was unceasing vibration from millions of insects throughout the livelong day, from the shores came the unearthly cry of the relentless cannibals." So wrote the explorer Stanley, of the river Congo in Africa, when, the first white man to see these scenes, he descended 2,000 miles of its great extent to its mouth. Far in the interior he had embarked on its waters, without knowing what river it was or where it would lead him. Livingstone, who had discovered the stream near its headwaters, thought it was the Nile because it flowed northward. But Stanley found that presently the river turned westward, and he began to suspect that the mighty stream upon which he was voyaging might be the Congo, whose mouth on the west coast was already known.



STANLEY FINDS LIVINGSTONE

Arrived at Ujiji on Nov. 10, 1871, Stanley greeted the veteran explorer with the famous words, "Dr. Livingstone, I presume?" With a kindly smile lighting up his rugged face, Livingstone answered, "Yes." So the outside world once again made contact with the explorer.

Stanley had entered Africa from the east coast, from Zanzibar, so that when he arrived at the Congo's mouth he had made the complete crossing of this equatorial belt of Africa from east to west, opening up this vast region to the world. The expedition took three years (1874-77), and cost the lives of all three of his white companions, and of many natives.

Launching of the Congo Free State

The results of this expedition were enormous, for it led directly to the formation of the Congo Free State and the exploitation of the region. Stanley himself, after England had refused to interest herself in the new territory, went back to Africa and under the patronage of Leopold King of the Belgians, head of the Congo Free State, took charge of opening the country to commerce, establishing trading posts and river navigation. The great abuses which sprang up later under Leopold's rule were in no way Stanley's fault, as he was throughout the friend

of the natives and worked for their good.

Stanley's interest in equatorial Africa had been first aroused some years before, when, as the correspondent of a New York newspaper, he had been sent to Africa to find the great missionary explorer, David Livingstone, who had at that time been lost to sight in the interior of Africa for five years. Stanley set out from Zanzibar for the interior on March 21, 1871. After conquering almost insuperable difficulties and travelling for nearly eight months he came to an Arab town named Ujiji on Lake Tanganyika. He had heard rumours from the natives that a white man with a white beard was in this town, and he marched into it between hope and fear. Good fortune was with him, for he found Livingstone, old, ill, and with scanty supplies. When he actually saw before him the great man for whom he had been searching so long, all young Stanley found to say was, "Dr. Livingstone, I presume!"

Stanley stayed in Ujiji four months and became a devoted admirer of Livingstone, but was unable to persuade him to leave his work and return to civilization. After the old missionary's death Stanley determined to continue his work of exploring the interior of Central Africa. The expedition down the Congo was the result.

Stanley's life throughout was an adventurous one. His name was originally John Rowlands and he was born in Wales. After a youth of extreme poverty, he ran away to sea and landed in New Orleans, U.S.A., where he was

adopted by a merchant named Stanley, whose name he took. He fought with the Confederates in the Civil War, and later became a newspaper correspondent. In this capacity he accompanied the British Expedition to Ashanti in 1873, and a year later set out on his second expedition across the African continent.

This time he travelled from west to east, ascending the Congo and cutting across the vast tropical forest to Lake Albert. Stanley's later years were spent in England, where he was elected to Parliament and was knighted. He died on May 10, 1904 and was honoured with a public funeral in Westminster Abbey.

COUNTLESS SUNS *that* FILL *the* SKY

It is believed that there are at least a thousand million stars in the sky, and that each one of these may be a sun, like the one that forms the centre of our solar system.

Star. Without a telescope fewer than 2,500 stars can be seen by the observer in the Northern Hemisphere—or in both hemispheres about



4,400—looking up at the heavens on the clearest night. And not every one of these is certain to be a "star." At least four or five may be "planets." (See Planets) The stars are in reality great balls of fire like our sun, and it is only because of their immense distance from the earth that they do not overwhelm us with a blaze of heat and light.

With modern high-power telescopes it is possible to see and photograph at least one hundred million stars, and even this does not exhaust the extent of the starry universe. For some years astronomers have been systematically photographing the heavens through their telescopes, bit by bit, and the camera is able to record on those photographic plates stars so faint as to be undetected by the human eye, even with the aid of the most powerful telescope. It is calculated that those plates will show about a thousand million fixed stars, and that altogether there may be some 15 times as many stars as there are people now in the world.

Mysterious 'Dark' Stars

There are hosts of "dark" or "dead" stars, some of which betray their presence by their effect on their luminous companions. Perhaps some of these dark stars are really planets revolving in solar systems similar to that of which the earth is a member. We cannot see these bodies, nor do they show in the photographs, but we can detect them in some instances by their periodical dimming effect on bright stars about which they revolve, thus producing a "variable" star. If this is true (and there is much evidence for this view), then somewhere in the universe there may exist worlds like our own—worlds where plants and animals and

thinking beings grow and develop much as they do on the earth.

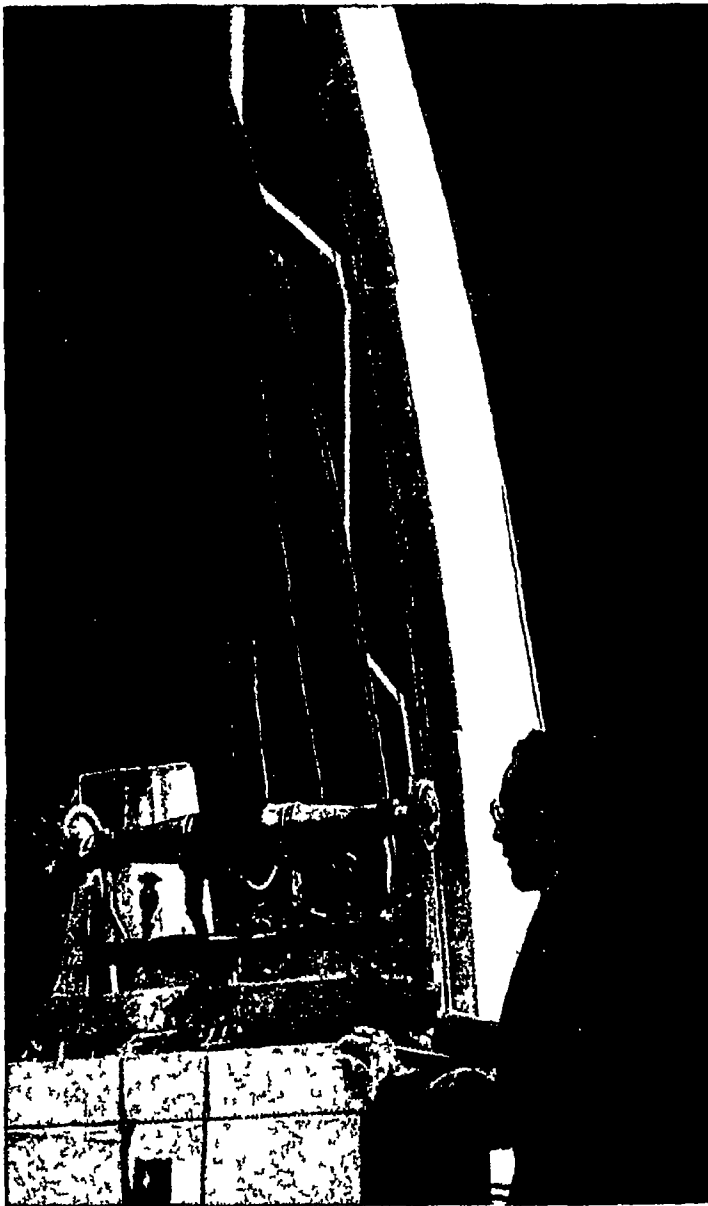
Even if the beings on these supposed worlds should develop wireless systems capable of travelling across interstellar space, it would take years and in some cases centuries for their messages to travel to us, in spite of the fact that wireless waves travel at the same speed as light, 186,000 miles a second. It takes over four years for light to reach us from the nearest visible star, which is Alpha Centauri (not visible in northern latitudes), while the rays of light that are now coming to us from some of the more distant stars undoubtedly started on their journey before the birth of Christ.

Measuring the Distances of the Heavens

How is it possible for men to measure these enormous distances that separate us from the stars? It is done by determining what is called the "annual parallax" of the star. This process consists in observing the star from one position in the earth's orbit, and then, six months later, from the opposite side of the orbit, and computing the resulting angle. The distances are so great that the angle is very slight, and the measurements must be so delicate that the parallax of only a comparatively few stars has been determined with approximate accuracy. The nearer the star, however, the easier it is to measure this angle, so we know that the many stars which are still unmeasured lie at a greater distance than those for which the parallax has been measured. The first parallax determination was made by Bessel in 1838.

Our universe, as astronomers conceive it, is a great sphere. Somewhere near the centre of this sphere lies the Milky Way, or Galaxy, a great concourse of stars and nebulae (See Nebulae). Most of the stars cluster in and about this huge ring or band, growing thinner toward the Poles. The earth and solar system seem to occupy a position somewhere near the centre of the ring, yet the movement of the stars is such that some day we may be carried to the outer edge.

If we look at the stars at a particular time at night, and then again an hour or so later,



G P A

TELLING TIME BY STARS

The checking and measurement of time is an important function of an observatory. Here you see an observer using a special telescope, by means of which the exact time is determined by the passage of a star across the intersecting point of two threads. The strip of light in the background is the opening in the dome of the observatory.

we see that they have changed their apparent positions in the heavens, with the single exception of the Pole Star. This change is due solely to the rotation of the earth on its axis. The ancients realized that at any particular hour on any particular night of the year the stars always present the same picture, and so they called them "fixed stars," as opposed to the planets, which they named the "wanderers."

But the stars are not really fixed, any more than the earth and the sun and the moon are fixed. They are moving among themselves with enormous velocity, and, so far as we now know, almost in straight lines. Our sun, which is itself a star, is moving with the whole solar system in the direction of the first-magnitude

star Vega at the rate of 700 miles a minute, but even at this terrific speed it will take 400,000 years to arrive, if nothing interferes to change its direction or retard its progress.

Some of the other stars move so fast that it seems certain that they will some day escape from our universe altogether, going out into space or nothingness, or perhaps toward other universes. These "runaway stars," as they are called, have in some cases a velocity as high as 200 miles a second, which means that they could go completely round the earth in a little more than two minutes.

Stars are ordinarily classified by "magnitudes," in the order of their brightness. In the "first magnitude" are placed the 20 brightest stars—Sirius, *Canopus, *Alpha Centauri, Vega, Capella, Arcturus, Rigel, Procyon, Achernar, *Beta Centauri, Betelgeuse, Altair, *Alpha Crucis, Aldebaran, Pollux, Spica, Antares, Fomalhaut, Deneb, and Regulus. (Those marked with an asterisk (*) cannot be seen in northern latitudes). In the second group are 50 stars, including the Pole Star as well as the two Pointers.

In the third group we have 160, in the fourth, 500, in the fifth, 1,500, in the sixth, 4,000, and so on, until in the magnitudes between the 16th and 17th there are supposed to be more than 50,000,000 stars, none of which, of course, can be seen without the most powerful telescopes. The stars seem to twinkle because of the effect produced on the light waves by the earth's own atmosphere. The human eye unaided by a telescope cannot see stars of less than the sixth magnitude.

The larger groups or constellations which the stars seem to form in the sky have been given various fanciful or legendary names—for example, Ursa Major (the Great Bear), Lyra (the Harp), Taurus (the Bull), and Orion (the Warrior). (See Constellations). In our system of cataloguing it is usual to designate the stars in each constellation by Greek letters in the order of their brilliance. Thus the pointer star nearest Polaris is named Alpha Ursae Majoris (brightest star of the Great Bear).

Let us consider some of the brighter stars. The one most important to navigators and explorers is Polaris (the Pole Star), which, though it appears to us as a somewhat dim star of the second magnitude, is seen through great telescopes as a triple sun—really three

STAR

stars instead of one, but so far away that they cannot be distinguished by the naked eye

The most brilliant of all stars is Sirius, the 'Dog Star,' best observed about the first of March. This great sun, which is more than three times as large as our own, has had an interesting career in the annals of astronomy.

The discoverer of Halley's comet was the first to suspect that Sirius was not behaving exactly as it should, but it remained for F. W. Bessel in 1844 to work out the facts, though they could not then be demonstrated for lack of powerful enough instruments. He declared that Sirius had an unseen companion star, about half as large, that the two revolved about the same centre of gravity, and that they were approaching the solar system at the rate of about 360 miles a minute. Alvan G. Clark found this companion star with a new telescope he had constructed, and thus Bessel's computations were completely verified.

Sirius is comparatively near to us, being the fifth in distance from the sun. But just to give some idea what "near" in this connexion means, let us set down the figures. Sirius is 51,000,000,000,000 miles from our earth! If Sirius were travelling in our direction about six times as fast as the fastest projectile that ever left the muzzle of a great gun, it would not reach us in much less than a quarter of a million years.

The companion of Sirius does not interfere with the light it sends to the earth, but in the case of Algol, which also has a companion star,

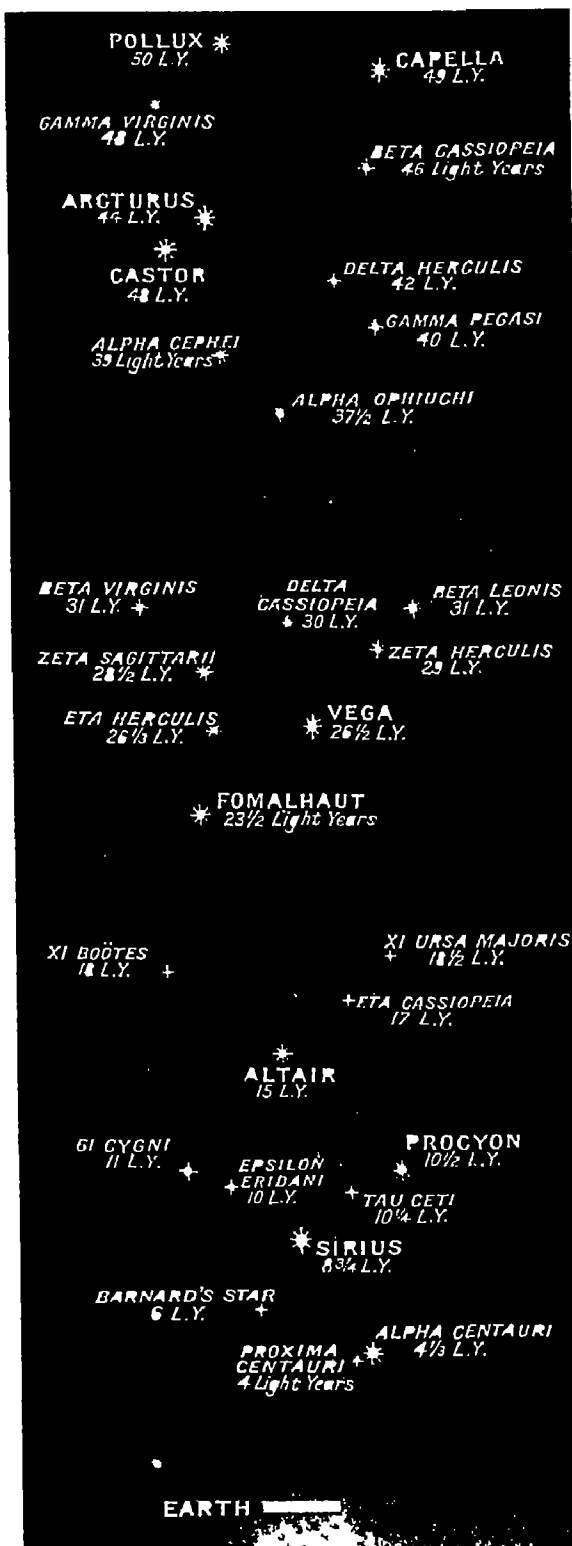
a regular eclipse occurs. Algol, "The Demon," was so called by the Arabs because it shines with the brightness of the Pole Star for about two and a half days, when suddenly its light is reduced by two thirds, then in a few hours it regains its intensity.

This queer behaviour is due to Algol's dark companion, which, in circling about, gets between the star and the earth and shuts off part of the light which we receive from it.

Over 50 eclipsing "variables" of the Algol type are known, and it is estimated that one star in every four has a partner or companion star. More than 13,000 such stars have been observed and counted.

Vega is interesting not only because the solar system is travelling towards it, but because in about 12,000 years it will become the north star instead of Polaris. This is due to what is called the "precession of the equinoxes," which causes the true north and south axis of the earth to move in a circle with respect to the stars, like the upper part of a spinning top.

Sometimes stars explode. A star which is ordinarily so dim that it can be seen only with a powerful telescope, if at all, may suddenly flare up and become so bright that it is visible to the naked eye. Some of these *novae* (new stars) flare more than once, but they all eventually decline to their former magnitudes. One of the brightest novae appeared in the summer of 1918 in the constellation Aquila, blazing out as brightly as Sirius, then becoming invisible to the naked eye. Another one, Nova Hercules, flared up



DISTANCES OF THE NEARER STARS

Above are shown thirty of the nearer stars at their proportionate distances from the earth, but not in their relative positions. The number of years the light from each one takes to reach us (L.Y.) is a measure of their distance.

twice between December, 1934, and June, 1935. The cause of these explosions is not certainly known. Novae are not the same as "shooting stars" (See Meteors and Meteorites)

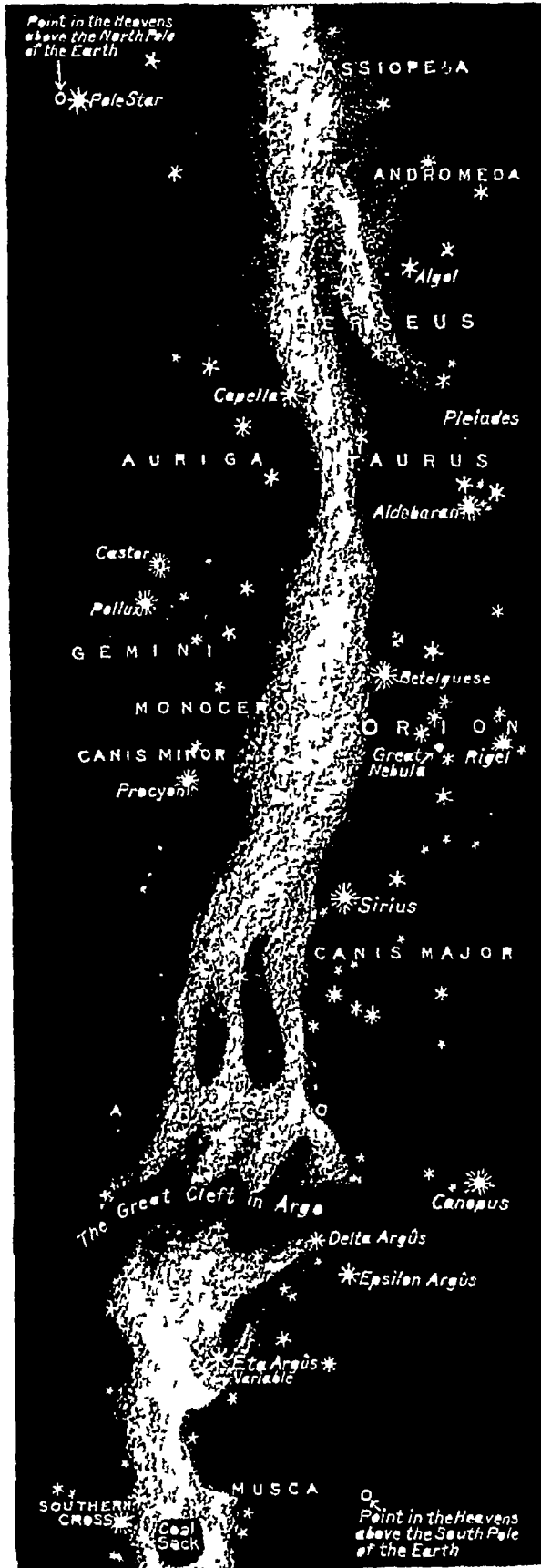
The stars are of different colours—white, blue, yellow, or red. By means of the spectroscope we can ascertain the chemical elements of which the stars are composed (See Spectrum and Spectroscope). Nor is that all, for spectra differ with temperature, so the spectroscope can tell us how hot a star is. This knowledge, coupled with what we know about the structure of matter and its behaviour under different temperatures (see article on Atom), enables us to compute the approximate size of a star whenever it has a companion, and its age compared to the sun.

Thanks to this new knowledge, scientists now believe that stars are either "giants" or "dwarfs." A giant is a young star, just a mass of glowing gas, which is contracting and getting hotter because of the contraction. Sirius and most bright stars are in this class. At a certain point the heat checks further contraction and the star remains stable, with a density nearly that of water, radiating heat into space, like our sun. Finally it cools rapidly, giving a reddish light, and dies. The Sirius companion is in this

phase, and has contracted to so dense a mass that one cubic inch of it would weigh a ton!

A peculiar class of stars, more recently discovered, contains the *Cepheids*—variable stars, formerly supposed to have companions. But the spectroscope indicates that they expand and contract.

A recent achievement of astronomy has been the invention of a method for determining the diameter of stars, by Professor Michelson. The stars are so far away that they appear as points in the telescope, no matter whether large or small, and so cannot be measured by any previously known method. Professor Michelson found, however, that if a plate containing two parallel slits be placed over the objective of the telescope, the image of a star viewed through the slits would be crossed by the bars of light and darkness, because of "interference" (See Light). Then as the slits are moved apart, the bars disappear. The amount of separation required to cause this disappearance depends upon the distance and diameter of the star. Using this method, members of the Mt. Wilson observatory staff found the diameter of Betelgeuse, the brightest star in the constellation Orion, to be about 250,000,000 miles—so great, indeed, that if its centre were placed at the centre of the sun, its outer edge

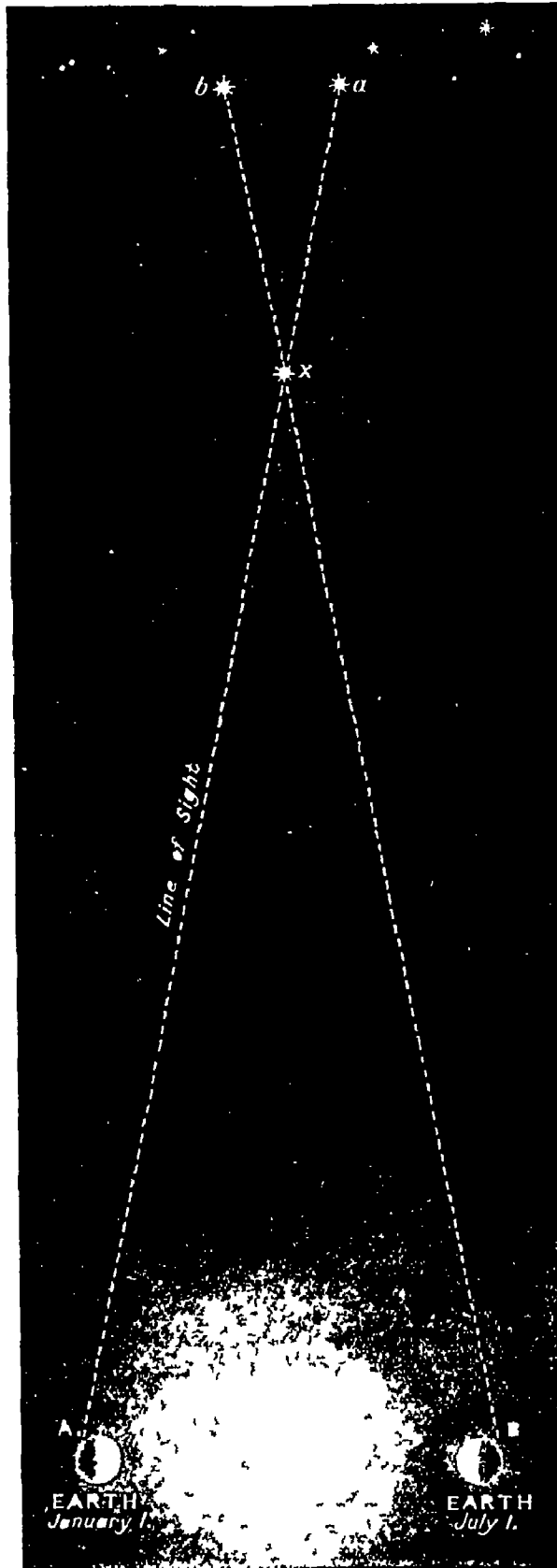


THE 'MILK' IN THE MILKY WAY

That long irregular belt of white across the sky, called the Milky Way, or Galaxy, is really made up of myriads of stars which are so far away they look like a misty band. This lovely, luminous belt may be seen, on a clear night, stretching in a tremendous arc from horizon to horizon. Stars are grouped more thickly in it than anywhere else in the heavens.

would lie just inside the orbit of Mars, thus engulfing nearly half of the whole solar system!

One of the most perplexing problems of modern astronomy is to discover the source of energy that maintains light and heat in the stars. Long ago it was suggested that the source of the sun's heat was contraction, but we now know that this could not possibly give sufficient energy to maintain the heat of the sun and other stars for any considerable length of time. Consequently we must look for other sources. One of the most promising of these sources is the destruction of matter itself. It is now believed that matter and energy are so very closely related to each other that a certain amount of energy is equivalent to a certain amount of matter and, conversely, that, accompanying the total destruction of matter, immense stores of energy are set free. The sun, for example, if it should *all* radiate away by this process, should last another 15,000,000,000 years. Where the mass came from in the first place, or whither the radiation is bound, no one can say. All the processes of stellar evolution, as we now conceive them, are downhill processes. Is there any process or place in the Universe where the action is reversed? If not, we seem to be on a slow but determined downward journey to an energyless and perhaps massless



MEASURING STELLAR DISTANCES

The star X, when observed from a position A on January 1, appears, in relation to the much more distant stars, to be at *a*. By July 1, when the earth is at B at the other side of its orbit, and 186,000,000 miles distant from A, the star X will appear to be at *b*. The distance from A to X can then be ascertained by a comparatively simple mathematical calculation.

solitude. But it is cheering to know that the end is probably billions of years away!

Let us imagine that we are given the strange power of departing from the earth and the solar system, and of moving endlessly outward in a straight line through space. When we get far enough out to view the galaxy to which the solar system belongs, we notice that it is a very fine watch-shaped cluster of stars about five times as great in diameter as in thickness, the large dimension being some 100,000 light-years. Its 30,000,000 luminous stars have patches of nebular material scattered through them, though this material is relatively small. (See *Nebulae*)

If our path carries us in the direction of the Great Nebula of Andromeda, where we arrive after a journey of some 900,000 light-years, we discover this to be another galaxy, rather similar to the one we left, containing an immense number of stars and a hot gaseous material from which stars will probably develop later. Looking back towards our former home, we see it as a dim spiral patch in space, for it, too, seems to be a rather well-developed spiral nebula.

Then, if we continue our journey, we shall probably pass near a few other such islands-in-space, and see many more in the distance. These are the "island universes." Our galaxy is but one of them. Remote from each other,

yet each colossal in itself, these smoky catherine-wheels of light dot the empty void we call "space" or "nothingness"

Einstein has proposed that a "straight" journey prolonged for an immense span of time might end where it started, for if matter is not infinitely far spread out in space, then space itself should be curved around matter so that our path would slowly be bent back like that of an ant crawling inside a great hollow glass globe.

When we think how long men have studied the stars, and yet how great are the marvels revealed in the past hundred years, there seems almost no limit to the hopes we may have of yet further knowledge of these mysterious worlds.

Starch. Stored up in most plants, especially in the seeds, bulbs, tubers, etc., is a substance called starch ($C_6H_{10}O_5$), which is one of the important products of plant life. Plants store their reserves of food in the form of starch, just as animals lay up a store of fat. It contains the same elements as sugar—carbon, hydrogen, and oxygen—but in different proportions. It occurs as small grains or granules, which differ in shape in each species of plant. Starch is found especially in cereals, potatoes, carrots, parsnips, sago, tapioca, and rice. Potatoes are about one-fifth starch, rye, oats, wheat, and maize about two-thirds, rice, about nine-tenths.

For commercial purposes starch is usually obtained from potatoes, wheat, rice, maize, or other grain. Potato starch is made by grating

potatoes, adding water, and straining, settling, washing, and drying. Wheat starch and rice starch are made by slightly different processes, to remove the gluten they contain. From maize, starch is made by soaking for 48 hours in water, then grinding and straining through sieves, after which the starch is allowed to settle in vats, when it is washed, bleached and dried.

As usually prepared, starch is a white or yellowish-white powder. In cold water it does not dissolve, but is merely suspended. In hot water the granules burst, forming a clear paste, which is the starch used in the laundry. Dextrine, the gum used on postage-stamps, is made from starch.

Starfish AND SEA-URCHINS Though they seem so different at first sight, these creatures all belong to the same great animal group, the *Echinodermata* ("spiny-skinned"), one of the most ancient in the whole animal kingdom.

A well-grown starfish of the common type you may find on the seashore has the shape of a regular five-pointed star, about 6 inches across and 1 inch thick in the centre. It is brown in colour and covered with a mosaic of bony plates and rows of points, and near the centre is a small sieve-like opening. This is its dorsal (upper) surface. The lower or ventral side shows a furrow, broadening from the tip of each of the five arms towards the centre, where a circular opening (the mouth) is closed by five pointed teeth meeting at the centre.



STARFISH TAKES A WALK ON THE SAND

P. Martin Duncan

Although you may quite often find starfish on sandy beaches when the tide is out, you seldom see one that has been walking about so energetically as this. The wet sand shows clearly the route he has followed and the deep imprint that his five "arms" left when he rested. He walks by means of the numerous sucking feet on the undersides of his arms. While the one here shown is a common starfish, some of the rarer forms have a different arrangement of arms.

That mouth opens into a loose bag of a stomach, whose folds extend out into the arms, and round it is a circular system of water tubes, blood-vessels, egg producing organs and so forth.

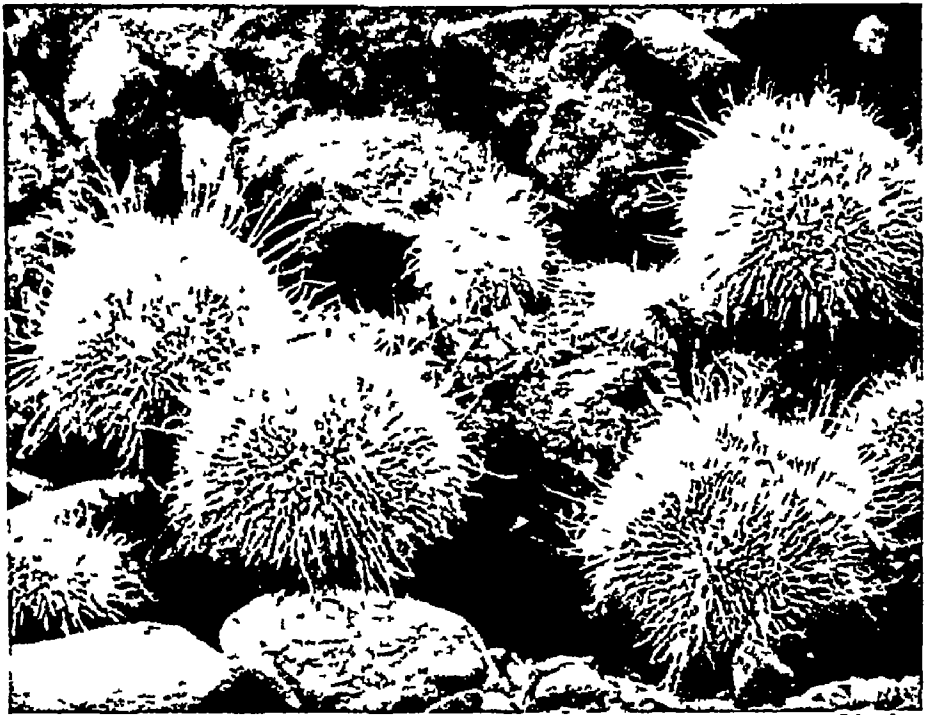
Now put your starfish into an aquarium. When he crawls up its glass wall, showing his underside, you see, pushed out from rows of tiny holes in the furrow, many glassy tubes ending in a sucker by which the animal clings to the glass. They are swollen with water sucked in through the sieve in his back, and it is by these "feet" that the starfish moves over the sea floor.

Starfish are of many kinds and varied shapes. Some are very thick, with short fat arms, others are small and round and flat, with snaky arms (brittle stars), others have many-branched arms (basket fish). If a starfish loses an arm it promptly grows another, and if it is cut into halves each piece grows into a new individual. Starfish are tremendous eaters and do much damage to oyster beds, crawling over the oysters and slowly pulling open their shells.

The sea urchins are as varied in shape as the starfish. Some are flat, and when you rub off the velvet like skin you find on the lower side a five pointed pattern of holes for tube feet, precisely as in a starfish. Another kind is the shape and size of a bun, and here, again, under the spiny coat of its flat lower side, you can see the five furrows. The heart urchins are heart shaped, and are often found as fossils in chalk cliffs. In the spherical or egg sea urchins, the furrows extend up the sides, and the tube feet, which come out along them, are longer than those of the starfishes. By means of these and its spines the animal moves.

Most sea-urchins sit calmly where they find themselves, hoping to be overlooked in their dull green or purplish coat by the big fishes and other enemies who consider their soft insides good eating. Their bristling spines protect them against small fishes, crabs, worms, etc.

In among the spines, which are mounted on a sort of hinge and can be waved about, are scattered many queer flexible appendages ending



SEA URCHINS LARGE AND SMALL

These are edible sea urchins one of the commonest species of this interesting group of marine creatures. As this photograph was taken in an aquarium it shows them with all their "arms" sticking out from between the spines ready to catch hold of anything that comes within reach.

in a sort of finger and thumb. With these the urchin (which is another name for "hedgehog") picks off and throws away particles of drift and dirt that get entangled in his rough overcoat. All get their living by scooping up mud, out of which the stomach extracts nourishment from the minute life it contains, or by nibbling edible things which adhere to rocks and weeds.

The eggs of some sorts of urchins are good to eat. From them hatch curious little creatures not in the least like adult urchins, which swim about for a long time until they are fully developed. All echinoderms go through a long and curious metamorphosis of this type. To this group also belong the sea-lilies, or crinoids, which show the same five rayed symmetry, and are like tall many branched plants. Yet even these start life as swimming creatures.

Starling. This bird (*Sturnus vulgaris*), with its beautiful black plumage brightly shot with purple, green, and steel blue, and most of its feathers tipped with buff, is now common all over Britain. Yet a hundred years ago it was almost entirely confined to certain parts in the south. It is a very active bird, sings well, and mimics the notes of other birds and any sound that takes its fancy.

Out of the fruit season, when its food is largely insects, farmers consider it a valuable addition to their bird population, but a large flock of hungry starlings is not welcome in field or orchard. When introduced into New Zealand, it became a very destructive pest.

In autumn and winter starlings gather in huge flocks and go through the most wonderful exercises in the air. They rise and fall, wheel, open out and close, just as if they were drilling. Starlings nest in holes in trees or buildings, but they often lay an egg on the ground, as though for fun.

State, Great Officers of. There were formerly nine Great Officers of State, who were Ministers of the British Crown. They were the Lord High Steward, the Lord High Chancellor, the Lord High Treasurer, the Lord President of the Council, the Lord Privy Seal, the Lord Great Chamberlain, the Lord High Constable, the Earl Marshal, and the Lord High Admiral.

At the present day only three of these are still members of the Government—the Lord Chancellor, the Lord President of the Council, and the Lord Privy Seal. Except that the Lord President presides at the rarely-held full meetings of the Privy Council, the two last-named offices carry no special duties, and are often held in conjunction with other offices.

The offices of the Lord High Treasurer and the Lord High Admiral are both now in Commission, the duties being performed by the Lords of the Treasury and the Lords of the Admiralty.

The Lord Great Chamberlain has charge of the Palace of Westminster, as the Houses of Parliament are officially called, and when the King opens Parliament in person he makes all the arrangements. He appoints a peer to carry the Sword of State and walks next to him in the procession. He also assists at the introduction of peers on their creation. He has special functions at Coronations.

The Lord High Steward is an office to which an appointment is made only for special events, such as a Coronation. The Lord High Constable originally commanded the King's Army, but that office is now in abeyance and is also only revived for a Coronation. The Earl Marshal is the head of the College of Arms, which makes grants of coats of arms to those entitled to them,

and he appoints the Kings of Arms, Heralds, and Pursuivants. He attends the sovereign when the latter opens Parliament in person, and arranges Coronations and other state ceremonies such as Royal marriages and funerals. Since 1672 the office has been hereditary in the family of the Howards, Dukes of Norfolk.

Statistics. When we toss a coin into the air we do not know whether it will come down heads or tails. If, however, we keep on tossing seven coins into the air, observing the results very carefully each time, we shall discover that it is most likely that three or four of them will

come down heads, while it is very unlikely that all of them will come down either heads or tails. The science of statistics tells us just how likely it is that a certain number of coins will come down heads. In a statistical investigation large quantities of data dealing with the point at issue are collected together and examined to see whether "on the average" or "in the long run" they show a systematic effect.

For example, an insurance company, calculating what premium to charge for its life policies, would like to know exactly when the insured person will die. It does not and cannot do controlled experiments that will give an accurate law either about that individual or about a group of people very like him. In real life there are too many factors connected with infection, epidemics and

motoring accidents for such a law to be of value.

So, the company collects a mass of statistics relating to the ages at which people die, and, by analysing them systematically, concludes that "on the average" individuals of a certain age will live so many more years. It compiles a "Life Table," and that table, embodying what is called a "statistical regularity," enables the insurance company to fix a premium that will meet such cases "on the average" (*See Insurance*). Sometimes the individual dies before the average, in which case the company may lose, if he has a long life, it gains.



A GREAT OFFICER OF STATE

Bernard Marmaduke Fitzalan-Howard, 16th Duke of Norfolk (above), is Earl Marshal and Hereditary Marshal and Chief Butler of England. By virtue of this office he was responsible for the organization of the Coronation ceremonies of King George VI in 1937. He is also head of the College of Arms.

The rule giving the average duration of life at various ages on which the insurance company makes its predictions is an illustration of a statistical law. It represents a regularity shown by groups or masses, and its application to an individual member of that group must be made with great care. It applies to an imaginary "average member" of the group.

In biological problems this question is of most frequent occurrence. A number of leaves are stripped from a particular tree and examined for some characteristic. What, if anything, can be deduced about a corresponding examination of any other batch of leaves from the same tree? A group of rats of so-called pure strain are fed on a particular diet, and show certain definite

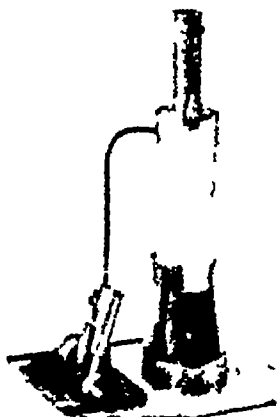
and measurable growth changes. How certain can we be that these same characteristics will be found among the next batch so treated? How general are our conclusions? It will be seen at once that we are here involved in the fundamental problem of scientific method, namely, how are we to generalize from experiment? This is usually referred to as the problem of induction.

It is in this sense that the Laws of Chance enter into our analysis of Nature—to provide general laws derived from individual behaviour and capable of giving predictions of behaviour of groups and masses in Nature. Many of the developments in science connected with atomic physics within recent years provide us with just this sort of information. (See also Census)

The MACHINE that PUTS STEAM to WORK

*This article describes the history and principles of steam engines in general
The application of steam to locomotion is discussed in the articles on
Locomotive and Railways, where the story is carried a step further*

Steam-engine. The steam engine is a device for converting the heat energy of steam into mechanical work, and thus belongs to the



Vertical steam-engine suitable for driving small models

class of devices called heat engines. Other forms of heat engine are the gas engine and the hot air engine, devices for turning the heat of exploding gas mixtures, or of expanding hot air, into mechanical work. Instances of steam being employed to do work date back to the 2nd century B.C., when Hero of Alexandria devised several forms of steam apparatus.

The beginning of the modern steam engine was in the water-raising engine of Thomas Savery in 1698. In this the steam acted directly on the water to be raised. The first cylinder and-piston steam engine was made by Papin, who in 1705 improved on Savery's engine.

Newcomen's Piston Engine

In the same year Thomas Newcomen made a piston engine which more nearly approached our modern form. It was, as its name implied, an atmospheric engine. The piston, working in a cylinder, was connected by a chain with one end of an overhead beam. Steam admitted from the boiler to the cylinder allowed the piston to be raised by a heavy counterpoise hung from the other end of the beam. Then the valve was shut and the steam in the cylinder condensed by a jet of cold water. This left a vacuum in the cylinder and the piston was forced down by the pressure

of the atmosphere, and work was done by lifting a pump rod fastened to the other end of the beam.

The story goes that a lazy, ingenious boy named Humphrey Potter, who had been set to turn the valve, made the engine close and open its own valves by means of cords, and thus invented the first automatic valve gear.

Watt—Father of the Modern Engine

The modern steam engine is due to James Watt (*see* Watt, James), an instrument maker for the University of Glasgow. Watt's great advances were: (1) condensing the steam in a separate vessel called the condenser, thus keeping the cylinder hot; (2) adding an air-pump to help to maintain the vacuum of the cylinder and remove the condensed steam; (3) jacketing the cylinder to prevent cooling off by conduction and radiation; (4) making the engine double acting, that is, forcing the piston back not by the atmosphere, but by steam admitted at the other end of the cylinder; and (5) using the steam expansively—in other words, stopping the admission of steam when the piston had made only a part of its stroke, and allowing the rest of the stroke to be performed by the expansion of the steam already in the cylinder.

Watt also invented a number of important details, such as the throttle valve for regulating the admission of steam, the centrifugal governor, the indicator for studying the actions in the cylinder, and, in conjunction with Murdoch, the slide valve for controlling the admission and release of steam. He also patented the device of two or more successive cylinders on one engine, or the modern compound engine plan, used in large engines where fuel economy is important.

To convert the straight line backward and forward motion of the piston into rotary motion,

STEAM-ENGINE

a connecting rod and crank on a fly-wheel are used. Steam-engines in all English-speaking countries are rated in horse-power. A 1-horse-power engine is one that has the power to raise 33,000 lb one foot in one minute. This unit of power was adopted because the first steam-engines replaced horses in pumping water from the English mines. When the mine owner bought a steam-engine, he wanted to know how many horses he could discard. As a matter of fact, only an unusually strong horse can lift 33,000 lb a foot in a minute.

Various terms are used to designate different forms of steam-engines. In a horizontal engine the cylinder and piston are horizontal with the bed-plate, and where space is no consideration such an engine has two advantages: the weight can be distributed over a large area, and the working parts are easily accessible. In the vertical engine the cylinder and pistons stand vertically above the crank-shaft. Marine engines are of this type. In an oscillating engine the

piston rod is connected directly with the crank shaft and the cylinder itself oscillates with the rotation of the crank-shaft. This movement of the cylinder serves to open and close the steam ports. Such engines were generally employed on paddle-steamers. High- and low-speed engines are relative terms. A speed of 150 revolutions per minute is a medium speed, much above or below this is called high or low. Non-condensing and condensing are terms referring to the exhaust. In a non-condensing engine the exhaust goes directly into the air, in a condensing engine the exhaust steam is condensed usually by contact with cool running water.

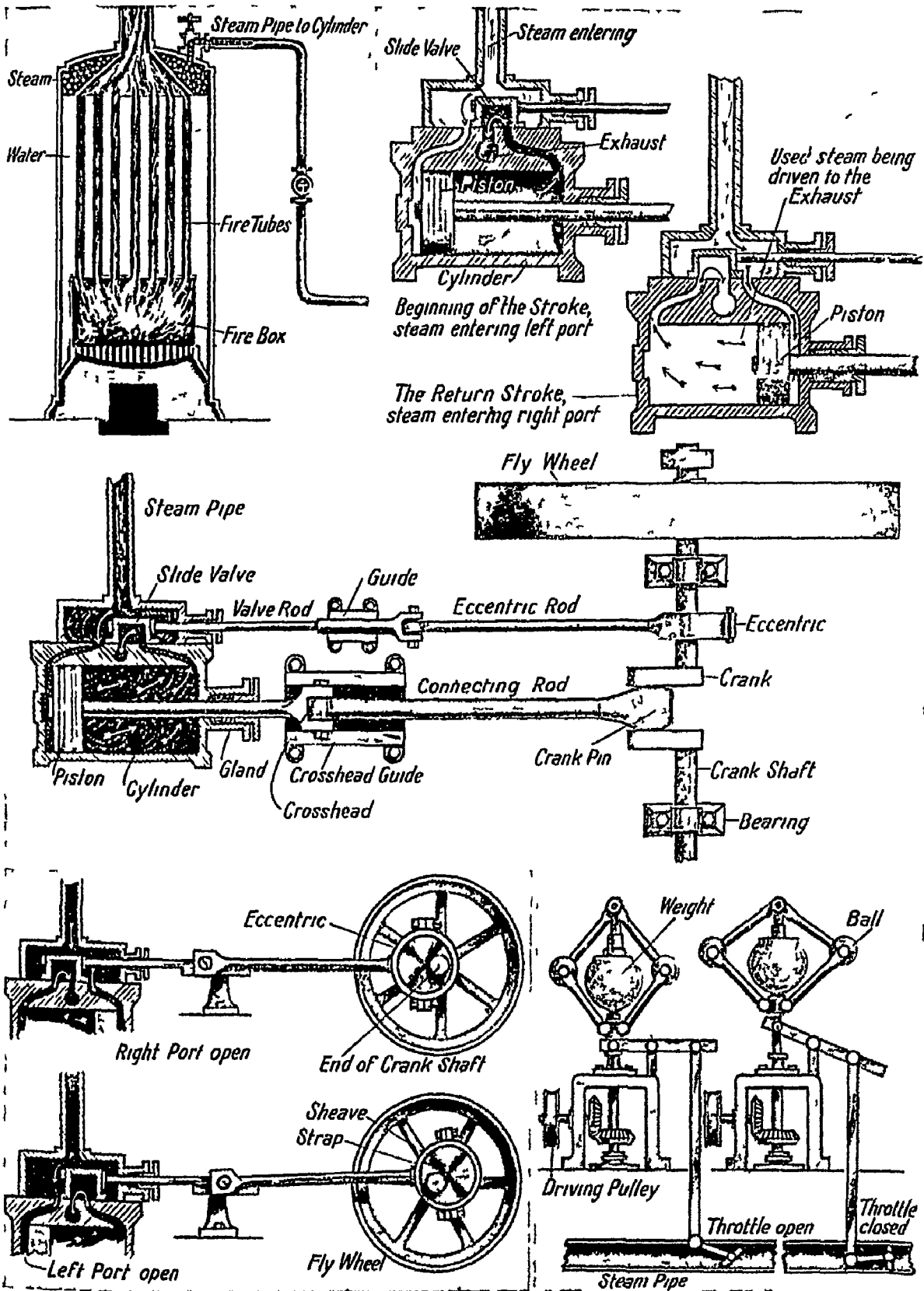
Simple and compound are terms referring to the number of expansions used in the engine. In a simple engine there are a single cylinder and a single expansion, in the compound engine there are at least two cylinders and two expansions. The steam from the boiler first enters the high-pressure cylinder and the exhaust from that cylinder actuates the low-pressure cylinder.



A STEAM-KETTLE POINTS THE WAY TO THE STEAM ENGINE

This picture painted by G. W. Buss shows James Watt's first experiment with the steam-kettle. The boy gazes in silence at the kettle on the breakfast-table, taking no count of time while musing over the marvels of steam, until his mother rouses him from his reverie by showing him her watch.

HOW A RECIPROCATING STEAM-ENGINE WORKS



In this page the working of the simplest form of steam-engine is seen—a horizontal reciprocating engine actuated by a single eccentric. The first diagram shows a vertical boiler in which the water is heated by flues from the furnace. From the boiler the steam is carried to the cylinder shown in the next two diagrams, first with the port for the admission of steam for the forward stroke of the piston open, and, second, with that for the admission of steam for the backward stroke open. In the centre diagram is seen a section of the engine from above, showing the connexions of the cylinder with the crank-shaft. The first of the two lower diagrams shows how the eccentric actuates the slide valve and opens or closes the ports. The second shows how the increasing speed of the engine causes the governors to move outwards and the throttle connected with them to close down until the speed of the engine is reduced to that for which the governors are set.

STEAM-ENGINE

Compound engines are more economical, and great steamship engines are usually triple expansion

The boilers, formerly made of wrought iron, are now almost always constructed of steel, and steam pressures of 200 to 250 lb to the square inch are not uncommon

Forms of Boiler

The earliest boilers had only one or two large flues running through them from the fire box. Later boilers had a large number of fire tubes from the fire box to the smoke box, into which the steam from the cylinders is exhausted and escapes into the outer air. The draught created by the exhaust draws the heat from the fire box through the fire tubes, and also increases the blast in the fire box. Later still came the water tube boiler in which the water passes in tubes through the furnace, and steam at a high pressure is quickly generated. In a super-heated engine, after the steam is generated in the boiler it passes through a superheater in which gases from the boiler raise the temperature of the steam without increasing its pressure.

Attached to the boiler are a pump or injector for supplying it with water, a water-gauge to indicate the amount of water in the boiler, a steam-gauge which shows the steam pressure, and a safety-valve to release steam should it rise beyond the pressure which is safe.

In order to understand the principle upon which a simple steam-engine works, we must have some idea how the power, which must be supplied to the engine to enable it to perform its duty, is obtained.

This power has its origin in water in the form of steam, which is water in its gaseous state. We all know that steam is produced by boiling water, and that heat must be applied to the water to convert it into steam. It is the heat energy put into the steam which is turned into useful work by the engine.

If we keep on applying heat to water in a totally enclosed vessel, the heat energy accumulating in the steam will cause the pressure to rise until a point is reached when the container can no longer withstand the strain and the vessel bursts, that is, the heat energy of the steam is converted into mechanical energy.

Expansive Power of Steam

The reason why the pressure increases is because steam at atmospheric pressure requires a space 1,600 times greater than that occupied by the water from which it is generated, and as more and more steam is produced requiring more expansion room which it cannot obtain, it sets up or exerts a pressure. We see then that it is the expansive force of the gas given off by boiling water that runs the steam-engine.

The boiler in which steam is generated is usually constructed of steel, and is strong enough

to withstand a much greater pressure than that required by the engine.

The confined steam passes through a pipe—called the main steam pipe—to the steam chest of the engine, where it is distributed to act on the piston, as we shall see later on.

A safety-valve is fitted on the top of the boiler. This device is one of the most important requirements of the boiler, as it provides a means of automatically releasing and relieving the pressure of any excess steam which might otherwise accumulate and raise the pressure too high for the strength of the boiler.

An opening is therefore provided in the top of the boiler, which is kept closed by a valve held down by a weight or spring.

Now when the stop-cock in the main steam pipe is opened, the steam rushes into the steam chest and cylinder and then comes into contact with the piston, driving it forward to the other end of the cylinder.

How the Slide Valve Works

When the piston has reached the end of its journey, however, an ingenious piece of mechanism, called a slide valve, comes into action, which shuts off the steam from that side of the cylinder and allows steam to enter in the other, driving the piston back into its former position.

At the same time that this is taking place, the slide valve puts the end of the cylinder which received the first charge of steam into communication with the atmosphere, which allows the exhausted steam to escape by being forced or swept out by the returning piston.

As the crank-shaft to which the fly-wheel is attached is connected to the piston through the medium of the crank, connecting rod and piston rod, it follows that the wheel will be forced round once to every combined forward and return stroke of the piston.

The slide valve obtains its motion from an eccentric which is a disk fixed to the crank shaft, but placed out of its centre. The result of this eccentricity is that a similar motion to that obtained by the use of a crank, but having a shorter range, is set up and effects the moving of the eccentric rod which is joined to the spindle of the slide valve.

In all steam-engines reversing gear is essential. One of the earliest and most common of these devices is Stephenson's link motion, invented by George Stephenson. (*See Locomotive*)

One of the most ingenious pieces of mechanism on a steam-engine is the governor. It consists of a vertical spindle, at the top of which are two hinged arms each terminating in a heavy ball. The spindle is rotated by a connexion with the main shaft of the engine. On the spindle is a movable sheath connected with the two arms and with a lever which controls a valve in the steam pipe. Should the speed of

the engine increase, centrifugal force causes the balls to spread outward, raise the sheath, and reduce the inflow of steam to the engine until normal speed is regained. The slightest variation of speed affects the governor, and the engine is thus kept running at an even speed.

Steel. Any combination of iron—usually with carbon—that is very malleable (capable of being extended by beating) at some high temperature, and is capable of hardening greatly by sudden cooling, was formerly defined as steel. The name is now generally applied to any iron obtained in a liquid state, provided it is malleable, regardless of the percentage of carbon it may contain, and regardless, therefore, of whether or not it possesses the property of becoming hard on cooling. Varieties of steel are classified according to the presence or absence of slag, their carbon content, and their alloy (such as aluminium steel, chrome steel, manganese steel, etc.) (See Iron and Steel)

Stephen, KING OF ENGLAND (1097?-1154) The 19 years that Stephen, grandson of William the Conqueror, reigned over England were one prolonged contest for the crown, with the result that feudal anarchy grew year by year, and the people were sorely oppressed.

In the lifetime of Henry I the barons had sworn fealty to and had recognized as heir his daughter, Matilda, widow of the German Emperor, Henry V. After his death, however, in 1135, they chose as King of England and Duke of Normandy the easy-going Stephen of Blois, son of Henry's sister, Adela, who thereupon usurped the throne.

Matilda did not let her inheritance slip without a struggle. Her husband, Geoffrey of Anjou, successfully asserted her claim to

Normandy, and after his death their son, young Henry of Anjou, the future Henry II of England, took up the contest. Finally, in 1153, Stephen, wearied by the long struggle and saddened by the death of his eldest son, Eustace, agreed to the Treaty of Wallingford, by which Henry should succeed to the throne after Stephen's death. Stephen died the next year.

In the meantime England had fallen into the greatest misery that was ever her lot. It was the only time when feudalism reigned unchecked in the land. Lawless castles sprang up everywhere, and their garrisons lived by plundering the people. "If three men came riding into a town," says the old English chronicle, "all the inhabitants fled." And again, in speaking of the cruelties practised by the inmates of the castles, "They hanged up men by their feet and smoked them with foul smoke. They put knotted strings about men's heads and twisted them until they went into the brain. They put men into prisons where adders and snakes and toads were crawling, and so they tormented them." Such horrors lasted the greater part of Stephen's reign, and were ended only with difficulty by Henry II.

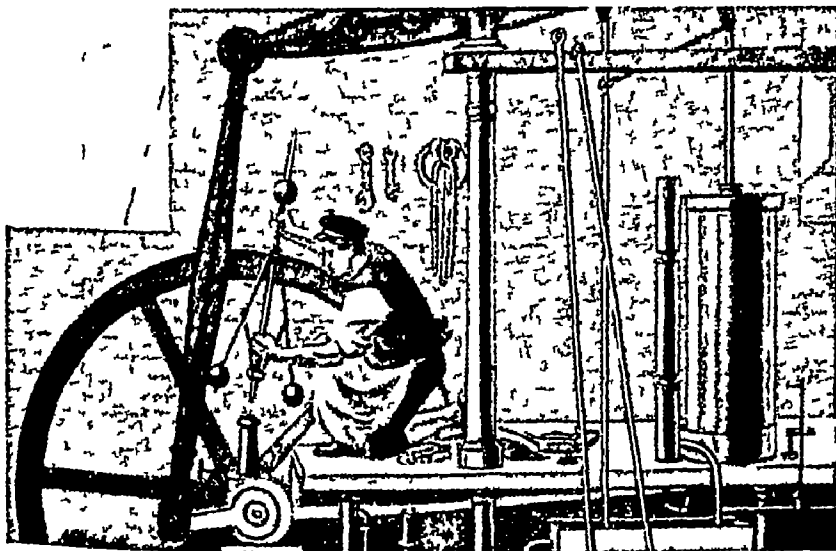
Stephenson, GEORGE (1781-1848) Few great inventors had as humble a beginning as

Stephenson. His father was fireman of a colliery pumping engine in the mining village of Wylam, near Newcastle-on-Tyne. One room in a cottage near the pit-mouth, which also sheltered three other families, was the home of his parents and their six children. School was not to be thought of, bread was not always to be had in sufficient quantity. In this grimy village he spent his babyhood, childhood saw him below the ground. At 14 he was promoted to be his father's assistant, and for this work he received the wage of one shilling a day. At 21



COIN OF STEPHEN

Stephen seized the throne on the death of his uncle, Henry I, and his reign became a byword for lawlessness. Above is a reproduction of a coin of his reign, in the British Museum.



STEPHENSON INVESTIGATES WATT'S WORK

Here you see young George Stephenson, who invented the first really serviceable locomotive, making himself acquainted with the working of Watt's steam engine. Night after night he dismantled and reconstructed it, to improve his knowledge of its mechanism.

he himself was an engine-man at two shillings, with his father under him as a fireman

Eager to add to his knowledge of engines and steam, Stephenson at 18 entered a night school, learning at the age of 19 to write his own name. Most of his spare time was devoted to work and study, and his self-improvement brought him steady promotion. At 31 he was "engine-wright" (builder and erector of stationary engines) at Killingworth Colliery and earning a £100 a year—equal to about £400 nowadays—which enabled him to send his son to school. He first became known to the general public by the invention of a miner's safety-lamp, which he perfected about the same time as Sir Humphry Davy produced his. There was a violent controversy as to whose invention was really first, but there was no doubt of the independence of their discoveries. Stephenson was granted £1,000 in 1818. Meanwhile, Stephenson's position permitted him to experiment with the construction and operation of steam-engines.

It was then the practice in such places as Killingworth Colliery to lay wooden or iron plates as tracks for the wheels of horse-drawn coal-trucks to run on. Why not use steam instead of horses to pull the trucks? The idea, in fact, was "in the air," and, after seeing experiments of the kind, Stephenson persuaded his employer to back such a project. His first engine, completed in 1814, ran successfully, in his second he improved Watt's engine by turning the exhaust steam into the chimney. His engine, "Locomotion," run over the Stockton and Darlington Railway at its opening in 1825, was the first ever used to draw goods and passengers. His "Rocket" in 1829 won the £500 prize offered by the Liverpool and Manchester Railway for the best locomotive engine. (See Locomotive)

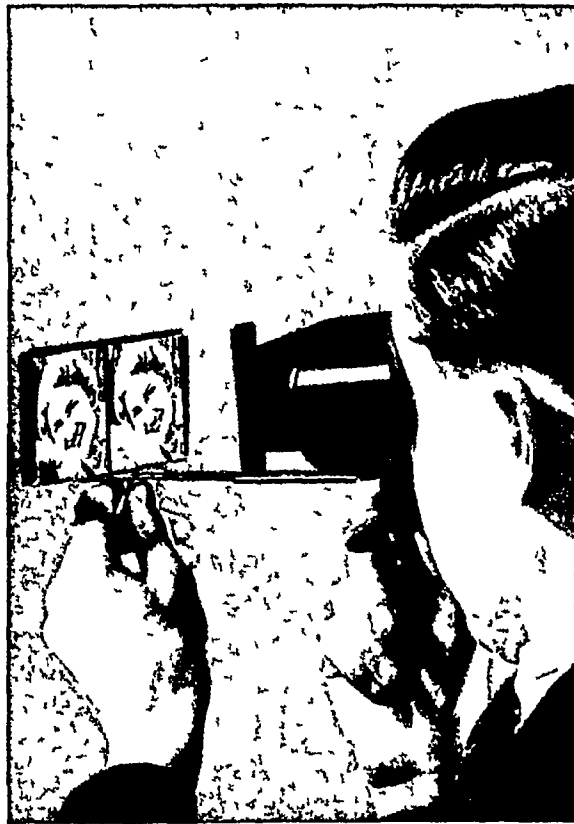
Stephenson was now a "made man," and henceforward, until he retired to live the life of a country gentleman, was the great railway builder and consulting engineer not only of England but of all Europe.

His son Robert (1803-1859) inherited his father's abilities. He became a noted international engineer, among his works being many railways, including the London-Birmingham railway (built 1833-38), and famous bridges in various parts of the world, notably the tubular Menai Strait bridge. He helped to develop his father's locomotive factory, and later made his firm the leading locomotive manufacturers in the world.

Stereoscope. Perhaps you think that both eyes see the same object in exactly the same way, but this is by no means the case. For actually the right eye sees more of the

right side of an object, and the left eye more of the left side, as you may observe by looking at an object with one eye closed, then the other. The brain puts these two images together and we see them as one object. That is how we get our impressions of depth, solidity, or relief.

The ordinary camera has only one "eye" or lens—consequently photographs appear flat. The principle of the stereoscopic picture is the same as that of the eyes, for it presents two images taken through different lenses. Two photographs are taken simultaneously with a "stereoscopic" camera, so arranged that one lens photographs it from an angle slightly to the right and the other from an angle to the left. These photographs (stereographs) are then mounted side by side.



For Photos

USING A STEREOSCOPE

By presenting to each eye separately a flat image of an object as it would be seen by the respective eyes the stereoscope produces an effect of natural relief. The photographs are taken by a camera with two lenses placed a few inches apart.

The stereoscope itself is an instrument with a similar pair of lenses for looking at such photographs. The two images are so blended by the brain that we see a single picture, in which every part stands out solid with life-like effect.

The principle of the stereoscope (from the Greek words, *stereos*, "solid," and *skopein*, "to view") is used in binoculars ("double eyed" field-glasses) and in opera glasses. There are also binocular microscopes and telescopes, and attempts have been made to apply the principle to moving pictures.

The stereoscope is a comparatively modern invention, the first of the kind having been

devised by Sir Charles Wheatstone (1802-1875), the English physicist, in 1838. The stereoscope invented by Wheatstone was greatly improved upon by Sir David Brewster, who in 1849 devised a lens stereoscope, which became very popular. The open form of stereoscope was devised by Oliver Wendell Holmes.

Stereotyping. Large daily newspapers are printed with rotary presses which use curved plates. These plates must be made very rapidly. To produce them from flat "formes" containing type and engravings, the process called stereotyping is used. A large sheet of heat proof papier mâché is pressed down hard on the forme

to make a mould of its surface. This is called a matrix or mat. It goes into a caster which curves the mat to a half cylinder. Molten type metal pours in between the face of the mat and the core of the caster, producing a thin, curved plate called a stereotype. Each press cylinder carries two, representing two pages.

Many stereotypes can be made from the same mat or portion of a mat, and they can be made flat for flat bed presses as well as curved. Owing to the fact that stereotypes are cheaper than electrotypes they are gaining ground in the book and magazine field. (See Electrotyping, Newspapers, Printing)

'R. L. S.'—GREAT TELLER of TALES

The Samoan natives among whom Robert Louis Stevenson spent his last years called him "Tusitala," the teller of tales for to them, as to us, he was the beloved weaver of romantic yarns of adventure

Stevenson, ROBERT LOUIS (1850-1894)

The history of English literature records no braver story than the life and work of the blithe and gifted story teller, essayist and poet, Robert Louis (really Lewis) Stevenson. Born in Edinburgh, he spent much of his childhood in bed, with but the faintest hold on life. He died at the early age of 44. Yet within a period of 20 years, while waging one long fight with death, he produced an enormous amount of work of an enduring quality. Constant pain and overpowering weakness he did not permit to affect his gaiety of spirit, or to quench the flame of joy that burns in his work.

In few instances has there been such a consistent harmony between an author and his books. The man is revealed in all his writings, which for the most part touch the bracing things of life. His brave spirit and unconquerable cheerfulness are well expressed in the following little poem:

If I have faltered more or less
In my great task of happiness
If I have moved among my race
And shown no glorious morning face
If beams from happy human eyes
Have moved me not, if morning skies
Books, and my food, and summer rain
Knocked on my sullen heart in vain —
Lord, thy most pointed pleasure take
And stab my spirit broad awake
Or Lord, if too obdurate I,
Choose thou, before that spirit die,
A piercing pain, a killing sun
And to my dead heart run them in!



In the autobiographical poems entitled "A Child's Garden of Verses" Stevenson shows how, shut away from ordinary childish pleasures, he created a wonderful world of romance out of the simplest things. His bed was "the pleasant land of counterpane," not a weariness. His mother read to him the stories which he loved to hear, and his devoted nurse, Alison Cunningham, kept him alive by her tender care. Years later, according to Graham Balfour, his biographer, he told this pious old lady that it was she who had given him a taste for the drama. She indignantly answered that she had "never put a foot inside a playhouse" in her life. "Ay, woman," said he, "but it was the grand dramatic way ye had of reciting the hymns."

Youth in Lovely Surroundings

When he grew older, he was able to study engineering and law, but no regular study was possible in childhood. So he lived much of the time in a beautiful country home, or took journeys with his father, a civil engineer, inspecting the lighthouses about the wild coast. In this way his brain was filled with images of mountain, moor, and sea girt isles. His frail health very early settled the question as to whether he should carry on his father's business of engineering, practise at the bar, or devote himself to literature. "I was always busy on my own private end," he wrote, "which was to learn to write."

He spent several years in wandering through France, Germany, Belgium, and Scotland for the benefit of his health, and records of these journeys were given to the world in "An Inland Voyage" in 1878 and "Travels with a Donkey" in 1879.

Readers were charmed by the graceful and easy flow of his style, but they did not realize how hard a schooling he had given himself or



STEVENSON IN SAMOA

To the native inhabitants of Upolu, the Samoan island where he made his home, Robert Louis Stevenson was known as "Tusitala" (the teller of tales). In the evening it was the great author's custom to read to his wife and household (as seen above), or to play to them on his flute, an instrument of which he was very fond.

how he continued to labour in order to achieve perfection. In 1887 he wrote in a letter, "I imagine nobody had ever such pains to learn a trade as I had, but I slogged at it day in and day out, and I frankly believe (thanks to my dire industry) I have done more with smaller gifts than almost any man of letters in the world."

With the publication of his first long tale, the immortal "Treasure Island," in 1883, Stevenson became widely popular. He wrote many essays, poems, and short stories, and in 1886 another absorbing story of adventure, "Kidnapped," this being followed in 1893 by a sequel, "Catriona." These books have a Scottish background. Stevenson did not concern himself with the problems of life and society, the mysteries of

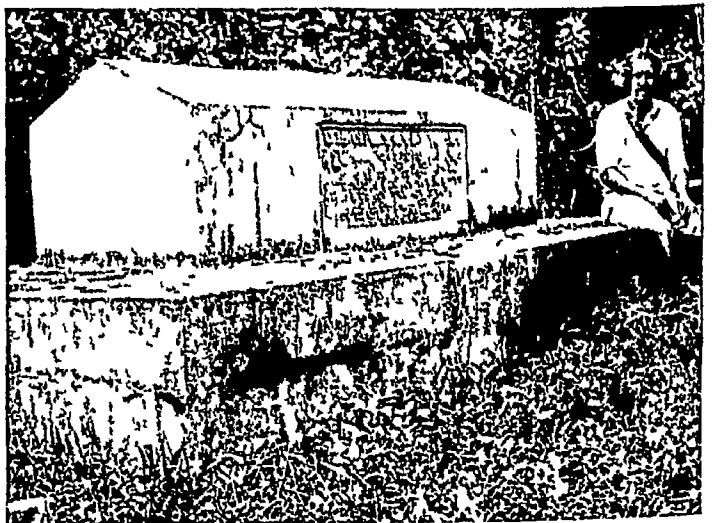
thought and conduct. He returned to the pure romanticism of Scott—the love of a story for its own sake, the delight in adventure, the spirit of eternal youth.

The great romance of Stevenson's own life began in France in 1876, when he met Mrs. Osbourne. She had returned to her home in San Francisco when Stevenson, hearing that she was ill, decided to follow her. He crossed the Atlantic in the steerage, and the continent in an emigrant train. The experience gave him material for several books, but, together with the hard times he suffered in San Francisco, it nearly killed him. He developed tuberculosis and would have died but for Mrs. Osbourne, who nursed him back to health.

In 1880 they were married, and Stevenson returned with his wife and stepchildren to Scotland, where they were welcomed into his father's home. The stepson, Lloyd Osbourne, collaborated with Stevenson in some of his stories, and also won distinction as a writer on his own account.

Stevenson could not stand the severe climate of Scotland, and so for years he wandered from place to place in search of a climate where he might live and work. At last he settled with his family in one of the Samoan Islands in the South Pacific. Here he gained four more years of life and of fairly good health.

The end of the brave struggle came quite suddenly. While talking on the



'HERE HE LIES WHERE HE LONGED TO BE'

On his death in December, 1894, Robert Louis Stevenson was buried, according to his wish, on the summit of Mount Vaea, in the Samoan island of Upolu, on a little plateau 1,500 feet above the Pacific ocean. Above is seen his South Sea Island grave.

veranda of his house at Vailima he had a stroke of apoplexy, from which he never recovered consciousness. The natives, who had come to regard him as their beloved chief and called him "Tusitala" (teller of tales), carried his body to Mount Vaea, cutting a path to the summit with their knives and axes.

There they buried him, and there he lies today in the green place of trees and birds and

wind-swept solitude, with the brave verses of his "Requiem" for an epitaph

Under the wide and starry sky,
Dig the grave and let me lie.
Glad did I live and gladly die,
And I laid me down with a will
This be the verse you grave for me
' Here he lies where he longed to be
Home is the sailor, home from sea,
And the hunter home from the hill "

The Story of 'Treasure Island'

IT all began when the old sailor who called himself "Captain" Billy Bones came to live at the inn kept by Jim Hawkins' father. He had a perpetual fear of being visited by a one legged sailor, and when he died, after a visit from a blind beggar named Pew, he had been given "the black spot," a signal that the pirate gang were after him. But before they had time to search his old sea chest, Jim Hawkins discovered in it the chart of Treasure Island, and took it to his friend, Doctor Livesey, and to Squire Trelawney. It was the squire who fitted out the *Hispaniola*, the schooner in which they sailed to seek the treasure, with Captain Smollett in command and the one legged Long John Silver as ship's cook.

The voyage to Treasure Island was uneventful, but just as they were arriving Jim overheard a conversation between Long John and another man, which confirmed the captain's suspicions that Long John and almost all the crew were members of the old pirate crew of Captain Flint, the original owner of the treasure. The crew came near to mutiny, but Captain Smollett gave them all leave to go ashore. Six mutineers remained in the ship, while Jim Hawkins also slipped ashore. Terrified, he later saw one of the faithful sailors murdered by Silver, while cries showed that another had been killed. Jim Hawkins then discovered a marooned man on the island, Ben Gunn, an old shipmate and enemy of Silver, who promised help

Meanwhile, the captain's party, consisting of himself, Trelawney, the doctor, and Trelawney's three servants, had left the ship, joined by Abraham Gray, one of the sailors who decided



Jim Hawkins, on his way back to his friends within the stockade, watches the pirates as they demolish the jolly-boat in which the captain's party came ashore

Courtesy of Cassell & Co Ltd



Long John Silver, having tried unsuccessfully to induce the captain's party to surrender, is threatening Doctor Livesey "Before an hour's out," he cried, "ye'll laugh on the other side!"

Courtesy of Cassell & Co. Ltd

to remain true to them. They had established themselves in a stockade discovered on a sandy hill near the shore, containing a hut which was built round a spring. In making a final journey from the ship, they lost their boat, and also one of Trelawney's servants, though not without mortally wounding one mutineer and killing another. While the pirates were demolishing the boat, Jim Hawkins found his way to the stockade.

In the morning, the pirates attacked the stockade, but were beaten off, losing five men,

the defenders lost Trelawney's other two servants and the captain was wounded. Later in the day the doctor set off to find Ben Gunn, while Jim Hawkins escaped on an adventure of his own. He discovered Ben Gunn's boat and made his way to the ship, which he cut adrift, but he himself was then swept away by the tide, and, worn out, he went to sleep. When he woke up he had drifted a long way, but he rediscovered the schooner, its sails set but no one in control. Jim boarded it and found that the two men left on board had fought, one was dead, the other badly hurt. But he revived this man, and with his help grounded the ship in a safe place, they then fought, Jim finally shooting this man also. Eventually he went ashore, but when he once more reached the stockade in the middle of the night he stumbled among the pirates, now in possession of it, and was taken prisoner. The captain's party, it seemed, had deserted the hut, leaving Silver and his five remaining men in possession, but Silver was now having great difficulty with the others, who wished to put Jim to death at once. Finally, they sent Silver "the black spot," the sign that his own turn had come, but he put them off by pointing out that Jim made a useful hostage, and by suddenly producing the plan of the island, which the doctor had evidently given him.

The pirate party set off for the treasure hunt, taking Jim with them and following the chart. This first led them to a skeleton, a grisly sign arranged by Captain Flint, and then they were terrified by a voice repeating from the undergrowth Flint's last words. It was the voice of Ben Gunn, but none of them believed he was alive. When they finally reached the spot where the treasure should have been, there was only an empty pit. Then the quarrel between Silver and his men came to a head, at the critical moment the captain's party appeared, killing two of the men, while the other

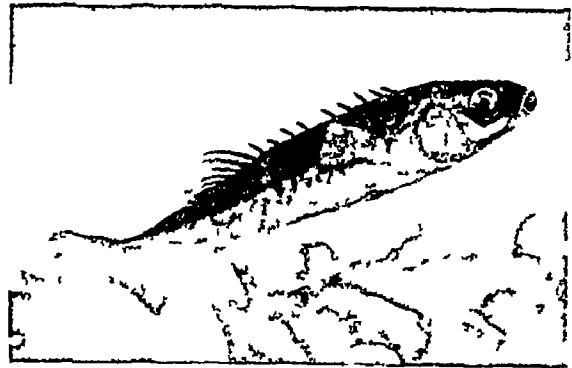
three fled, and all was over Long John Silver, having saved Jim Hawkins' life, was forgiven by the rest of the captain's party. The bulk of the treasure, which Ben Gunn had long ago discovered and hidden in his cave, was eventually loaded on board the schooner, provisions were left for the three deserted pirates, and, with a fair wind behind them, the adventurers saw the last of Treasure Island.

Stickleback. The life of this little fish is short, but full of excitement. At the age of about three or four years he has lived out his time, but he usually dies as he lived, by the "sword." He is a tyrant, cruel towards the weak, insolent towards the strong, always seeking a fight. Yet the male stickleback combines with his ferocious fighting qualities a great domestic virtue. It is he who builds the nest in which the female lays her eggs, and it is he who guards it jealously until the young are all safely hatched.

Sticklebacks are found throughout northern and central Europe, northern Asia, and North America. The common British three spined sticklebacks (*Gasterosteus aculeatus*) grow to be at the most 3 or 4 inches long, and carry sharp spines or thorns on their backs, which are formidable weapons. During the first year of their lives, they gather in small friendly groups. But with the coming of the next summer each male selects a territory which he fiercely defends against all comers, fighting other intruding males to the death.

Once established as master of his territory, the male stickleback builds his tunnel-shaped nest. By the time it is finished he has assumed his breeding dress of blue and red tints, and invites the female stickleback to share his home and lay her eggs. When the nest is filled, he mounts guard over it, fanning it with his fins to ensure a current of fresh water passing over the eggs. If a big fish or even a man's hand approaches, he sallies forth with spines erect to give battle in defence of his home and young.

The sea stickleback (*Spinachia vulgaris*), which attains a length of 7 inches, is well armed with 15 spines. In fresh water you may sometimes find the 10 spined stickleback (*G. pungitius*), which is even smaller than the common species.



TEN-SPINED STICKLEBACK

Although this individual has only nine spines, he is none the less a true ten spined stickleback for it does sometimes happen that one spine is missing. This is one of the less common species of this little fish, despite his greater number of weapons he is smaller than the three-spined type.

Stirling, SCOTTISH CO AND TOWN Stirlingshire is one of the larger Scottish counties, comprising 450 square miles. It is part-Highland, part-Lowland, for in the north-west area is Ben Lomond (3,192 feet), a well-known Scottish mountain, while in the south east mixed farming is carried on and coalfields supply fuel for industry. The ironworks at Carron near Falkirk have long been famous, and calico printing, bleaching, tanning, paper-making and brewing are among the other industries. Grangemouth, on the Forth, is the chief port. The battles of Stirling Bridge (1297), Falkirk (1298), and Bannockburn (1314), which achieved Scottish independence, all took place in Stirlingshire.

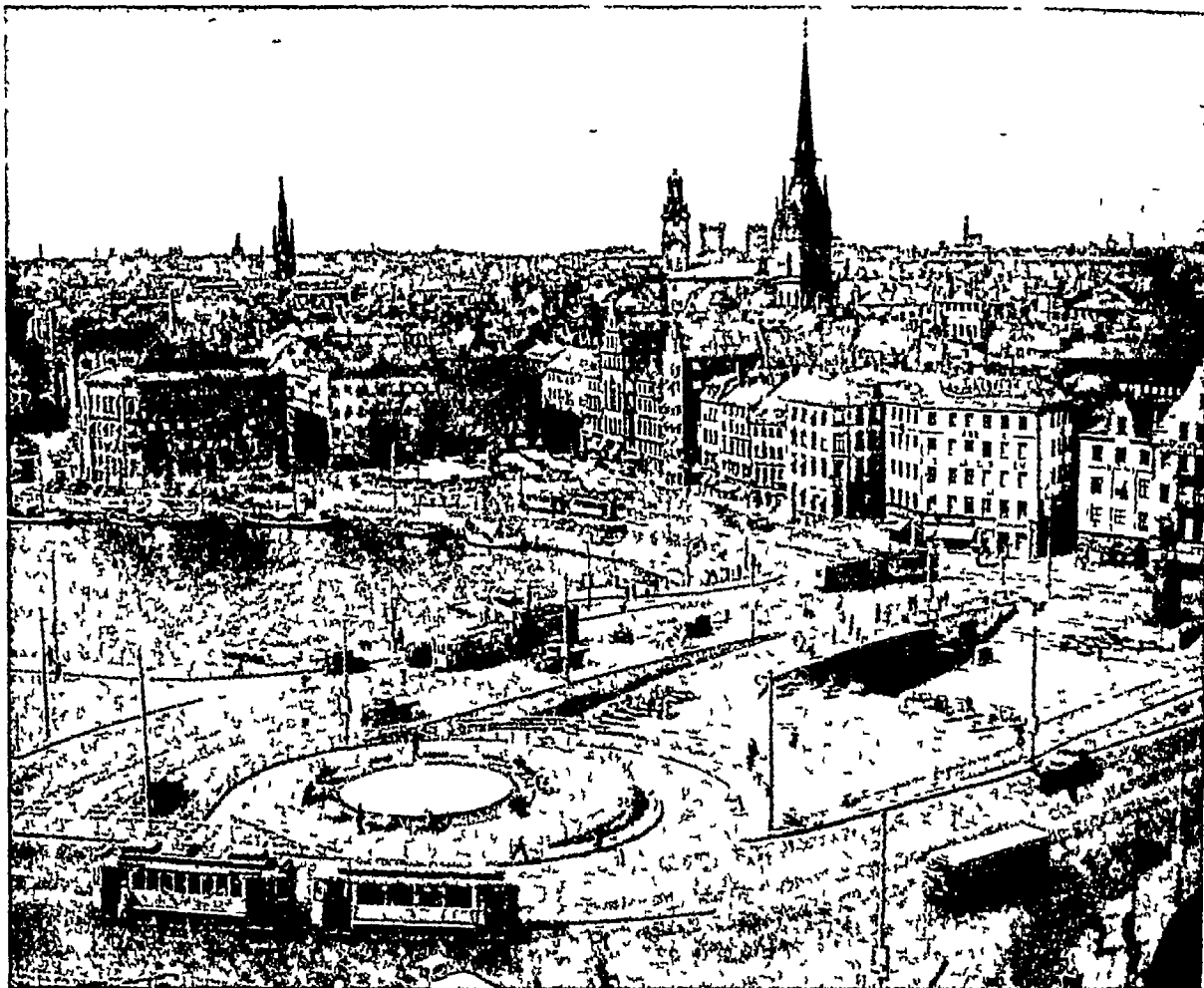
The town of Stirling, county town of Stirlingshire, grew up around the castle that crowns the precipitous hill on the right bank of the Forth. The castle is still the most prominent feature of the town. The exact age of it is unknown, but Alexander I died there in 1124, and many other Scottish monarchs have been closely associated with it. Near by is the parish church, in which Mary Queen of Scots and James VI were crowned. The population of the town is 22,000, of the co., 166,000.

Stitchwort. This is one of the commonest flowers of the early spring, lining the roadsides and the hedge-bottoms with its starry white flowers, and sprawling hither and thither over the other herbage. For its weak stems are scarcely able to support themselves, and, as



OUR COMMONEST STITCHWORT

One of the most frequently-seen of wayside flowers, the greater stitchwort lines the waysides in spring with its starry-white blossoms, here you see them about natural size.



STOCKHOLM—SWEDEN'S STATELY CAPITAL

M. O. Henchoz

Picturesquely situated on an archipelago of tree-clad granite islands, Stockholm is one of Europe's most beautiful capitals. Like many other cities it has its traffic problems, particularly with the huge number of vehicles moving north and south over the canal at Slussen (above). Here a crossing on the "clover-leaf" pattern, seen in the foreground, has been built to relieve the congestion. It will be seen that the "rule of the road" in Sweden is "Keep to the left" as in Britain.

they grow quickly, they must take advantage of every support they can find. The flowers of the greater stitchwort (*Stellaria holostea*), our commonest species, are over half an inch across, pure white in colour, with five deeply cleft petals. The narrow, simple leaves and lateral shoots are in opposite pairs, and this and other features show the plant's relationship to the campions (*q v*), in the order *Caryophyllaceae*. There are several other species of stitchwort, which appear in the early summer, but these are neither so conspicuous nor so frequent, the commonest of them is the lesser stitchwort (*S. graminea*), in which the petals are so deeply cleft as to appear as ten instead of five in number. The common chickweed (*q v*) is a member of the same genus.

Stockholm, SWEDEN Sometimes called the "Venice of the North," the capital of Sweden lies on a group of hilly islands and peninsulas in the midst of fiords and bays, streams and straits. One-seventh of the space within its limits is occupied by water, and in travelling from one part of the city to another, one is as likely to go by water as by road.

Many of the streets are so precipitous that lifts or steps are used to get from one to another.

The city falls into three principal sections, as we see from the Norrbro (north bridge), the handsome granite structure which links the modern business quarter to the north (Norrmalm) with the island Staden, where the old city was founded in 1255. Between Staden and the northern district, with its many fine public buildings, lies the little Island of the Holy Ghost, on which are the new Houses of Parliament. On the bank of Lake Mälär is the magnificent Town Hall, designed by Professor R. Östberg. When completed in 1923, after twelve years' work, this great building was recognized as one of the most important architectural achievements of the age.

Looking south towards Staden, we see in a corner of the island the Royal Palace. Near the palace is the oldest church in Stockholm, founded in 1264 and dedicated to St Nicholas, and beyond this is the Stortorg (great market). West of Staden, on a little island, is Sweden's chief temple of fame, the Riddarholm Church. Except when a member of the royal family

dies, no services are held here, since the time of Gustavus Adolphus (1594-1632) this church has been the burial place of the royal family. From the south end of Staden a wide bridge leads to Södermalm, the old southern quarter, whose steep rocky heights rise 120 feet above the water's edge. Traffic difficulties led to the complete reconstruction of this point, known as Slussen—the only direct highway from the centre of the city to the southern suburbs. Here, where some 45,000 vehicles and 250,000 people cross daily, a three loop elevated crossing on the American "clover leaf" plan has been devised. Further west there are new bridges across Lake Mälär that afford improved communication to outer Stockholm.

Looking east from the Norrbro we see another island, Skeppsholm, the headquarters of the Swedish Navy. Beyond it rise the beautiful wooded heights of the island of the Djurgården or Deer Park. Here is Skansen, the picturesque and interesting 70 acre park, illustrating the fauna and flora as well as the habitations and costumes of the peasants in the different parts of Sweden.

Stockholm is the chief cultural as well as the industrial and commercial centre of Sweden. It is the seat of the principal learned societies and royal academies, as well as of the Caroline Institute, the leading medical school, and the University of Stockholm. There are technical schools for agriculture, forestry, mining, engineering, etc., museums of art, antiquities, natural history, and anthropology, a Royal Opera House and a Concert House—the last another of Stockholm's remarkable contributions to modern architecture.

The city has a good harbour, kept open by ice-breakers during the winter. It is noted for its iron and steel products, including such varied things as dairy machinery, bridges, engines, turbines, and pneumatic tools. Other industries include shipbuilding, tanning, manufacturing of textiles and pottery. The population of Stockholm is about 556,000.

Stocks and Shares.

If you look at the financial page of your daily newspaper you will find a summary of

transactions on the Stock Exchanges in London and abroad, and a long classified list of "closing prices," showing how the various "securities" on the market have "risen" or "fallen."

To understand this, we must first find out what stocks and shares are. When a public limited liability company is "floated," or requires new capital, it publishes a prospectus, and issues shares in the "new issue" market. The same thing is done by the Government or municipalities when they require a loan.

The famous 5% Government War Loan (a stock—i.e., a *block* of divisible capital) was issued at 95—which meant that for every £100 stock the investor had to pay only £95 cash. Thus it was issued at a *discount*—below par or face value. Had it been issued at 102 (i.e., £2 above par) it would have been at a *premium*. At the end of its term a stock or bond (which is of some definite and indivisible amount) may be redeemed either at par or above par. Government stocks represent a



NEW YORK STOCK EXCHANGE

This animated scene shows the interior of the New York Stock Exchange during business hours. Here millions of dollars in stocks and bonds change hands hourly and colossal fortunes are lost and won. Membership of the Exchange is limited to 1,100, and candidates have to be formally elected by a committee.

good "gilt-edged" investment with a small but known return. The Post Office Savings Bank, it may be noted, invests its capital in Government funds, and pays its depositors a small rate of interest. Government stock may be bought through a P O S B account, only a very small commission being charged.

Classes of Shares

The members of the public who have subscribed to a new issue and to whom shares are duly *allotted* are then entitled to any dividend that may be announced by the issuing company, and also to a proportion of any assets should the company go into liquidation, or be "wound up." There are various classes of shares—*preference*, the claims of which come before those of any other shares, but which bring in a restricted dividend, *ordinary*, and *deferred*. Debentures and notes (short-term bonds) are loan capital, bearing interest at a fixed rate. This interest must be paid before any dividend is distributed to ordinary shareholders. Debenture stockholders and preference shareholders have no share in the running of a company, whereas ordinary shareholders are entitled to vote and take part in the general meetings of the company. Debenture holders are *creditors* of the company, ordinary and preference shareholders are its *owners*.

An unpretentious building in Throgmorton Street, London, is the home of one of the most important features of City life—the Stock Exchange. A private corporation, controlled by a Committee for General Purposes of 30 elected by the members, it exists as a central establishment for the buying and selling of stocks, shares, and other securities. "The House," in which no stranger is allowed, was founded in 1801, and has very strict rules of membership.

These rules are framed and enforced by the Committee. This body has the sole power to elect members, who must have served as clerks for at least four years and become shareholders of the Exchange. There are now over 4,000 members, and, in addition, there are members' clerks, both "authorized" and "unauthorized," who are required to put down substantial sums as entrance fees and annual subscriptions.

Brokers and Jobbers

Members of the Stock Exchange are divided into two distinct classes—brokers and jobbers. A broker's business consists in buying and selling securities for the outside public on commission. This commission is called "brokerage." A jobber usually deals in one particular class of security—"Kaffirs" (South African mining shares), Foreign and Colonial Rails, Home Industrials, Gilt-Edged, for instance—and takes up his stand in the market set aside for it in the Exchange. When approached by a

broker or broker's clerk regarding any security, he quotes two figures—the price at which he will sell, and the price at which he will buy.

The jobber may find that, at the prices he quotes, purchases are much in excess of sales. Then he must raise his prices, in order to deter buyers and encourage sellers. The City jargon for a slight rise is "hardening." When "prices harden" it is a sign that jobbers are finding buyers more eager. On the other hand, when the market is predominantly selling, the jobber does not want to accumulate those particular securities indefinitely. He, therefore, reduces his prices—prices "droop," or "fall away"—to discourage sellers and encourage buyers.

Stock Exchange Terms Explained

Sometimes people buy securities, not for investment, but to sell again at a higher price. Those buyers are called "bulls." They need not pay the full amount of the purchase price—they pay only a portion called the "margin." Every Settlement Day (normally once a fortnight) they must pay the full amount or pay a fee, the "contango," to someone who will lend the amount outstanding. This process is called "buying on margins." It enables people to speculate for a rise in price without using an enormous amount of capital. The contrary position, that of a "bear," is that of a person who, expecting the price to fall, sells for future delivery. He expects to be able to obtain the security in order to fulfil his contract, at a lower price. On Settlement Day he must deliver the security or pay a fee—"backwardation." Eventually he must buy. If his expectations are justified he makes a profit, but if the price has risen he loses.

The London Stock Exchange is open for business only from 11 a.m. to 4 p.m. Between 3 and 4 p.m. the prices quoted are termed "closing prices," dealings after hours are called "street prices," as they often take place on the pavement outside. The New York Exchange is known colloquially as "Wall Street" and those on the Continent as "Bourses."

No member of the Stock Exchange is allowed to advertise. The term "bucket-shop" has been applied to the office or business of unofficial brokers who, though not members of the Stock Exchange, undertake to put deals through for their clients and do their best to "fleece" them, by inducing them to invest in companies with very doubtful prospects. As a general rule, it is always best to consult one's bank manager, solicitor, or a member of the Stock Exchange, before investing money in stocks and shares.

Stomach. When you swallow a mouthful of food, the first stopping-place of that food is the stomach, an irregular cone-shaped bag, which is one of the principal digestive organs of the body. When it is empty, it hangs almost

vertical, when it is filled, it swings obliquely or crosswise in the abdomen

Four layers of tissues called coats or tunics, form this bag. From inside to outside they are the mucous, submucous, muscular, and serous. The muscular coat makes this bag very elastic. Ordinarily it is about 12 inches long and 4 inches across, holding about three pints but the ability to stretch enables it to hold more. There are two openings into this bag: one at the top, opening from the gullet (or oesophagus), called the "cardiac orifice," and the other, opening into the small intestine, and called the "pyloric orifice."

In the mucous lining of the stomach are found certain cells or glands, whose business it is to manufacture the gastric juice. This is one of the digestive fluids, and is made up largely of water, salts, hydrochloric acid, pepsin, and rennin. The peculiar churning movement of the stomach mixes the food with this liquid, which dissolves it and also changes certain parts of it. As you now see, the stomach is a distinct part of the intestines and the word should not be used loosely, to describe any other part of the anatomy. (See Digestion, and illus. page 1277)

Stone Age. A rough stone was the first weapon and the first tool used by Man. We may imagine a man climbing down from his tree

home, and finding a nut too hard even for his strong teeth. He picks up a stone and crushes the nut. He has invented the first hammer.

Then Man began gathering stones, little round ones to throw at birds and small animals and heavy ones to crack nuts and other stones. Perhaps he cut himself with a sharp stone and so discovered the first knife or hatchet.

Man Makes Use of Flint

Some thousands of years later the descendants of these early tree dwellers became dissatisfied with the shape of their stone tools and weapons. One of them succeeded in chipping a piece of flint into a more useful shape. With him began what scientists call the Old Stone Age or the Palaeolithic Age.

The discovery that flint would flake off and leave sharp edges must be ranked as one of the great discoveries of that early world. It enabled Man to wage successful war against wild beasts and to obtain food by hunting large game. Thus he developed the energy and confidence which enabled him to make further steps forward in civilization.

For perhaps 150,000 years, the rough chipping of flint for spears and hatchets, knives and arrows, continued. The workmanship became finer, and new tools were invented for scraping flesh from skins and for drilling and cutting



BRITTANY'S RIDDLE OF THE STONE AGE

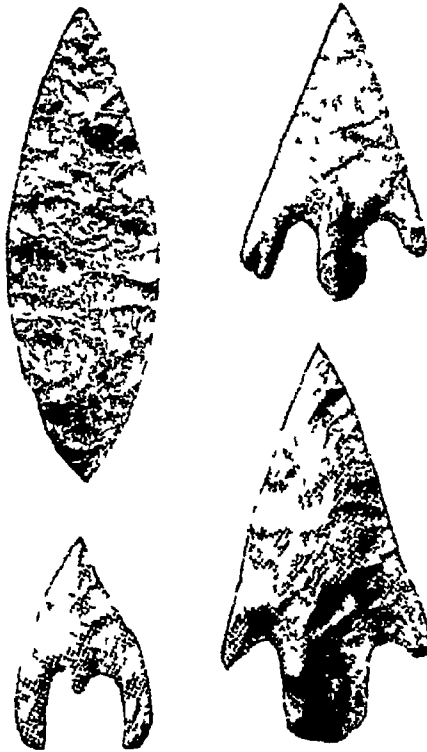
Carnac, in Brittany, is famous for its remarkable alignments of menhirs, or standing stones, relics of the Stone Age. In the Menec alignments, seen above, there are 1,099 stones arranged in eleven lines. The rocks are of the ordinary granite of the district and are coated with white lichens. There are gaps in some of the rows where stones have been removed to be used in local buildings. The actual origin and object of these rows of stones is still uncertain. In addition to these long avenues of menhirs there are dolmens ("stone tables") and barrows scattered throughout the district.

STONE AGE

bone and horn. Soon these last materials began to be used for weapons, along with stone. Crude fish-hooks were made, and arrows that had their points barbed. This was the age of the Cave-men (See Cave Dwellers).

Later still came the New Stone or Neolithic Age, when men learned to grind and polish the rough edges of their flint tools and weapons, so that a knife would cut more easily and a spear could be driven into an animal more surely. Last came the discovery of metals, chiefly copper and tin, which ended the Stone Age and marked the beginning of the Age of Bronze.

It is largely through the study of such old flint weapons that scientists are able to trace the story of Early Man. No definite date can be assigned to the beginning or end of the Stone Age, because this



NEW STONE AGE WEAPONS

During the Neolithic Age flint arrowheads became finer and sharper and so more deadly. Note how the top two above are clumsier than the later ones below.

STONEHENGE

earliest stage in the history of human culture was reached at different periods in different parts. In some places the use of stone implements continued into modern times.

Among the relics which are believed to date back to the Stone Age are monuments of huge rough stones. They consist usually of large single stones (*menhirs*) set on end in the midst of a plain, or of groups of such stones (*cromlechs*) arranged in circles or squares or of stones set side by side with a third stone bridging the top (*dolmens*).

Often these monuments show signs of having been rudely hewn by the prehistoric architects, and occasionally drawings and carvings appear upon them. Many of them are believed to mark the burial-places of noted chiefs, while the "circle-stones" may have been meeting-places of the skin clad clansmen. Great Britain and France are particularly rich in these relics, the most famous of which is the combination of "circle-stones" and dolmens called Stonehenge, on Salisbury Plain, Wiltshire (See Stonehenge). Avebury (*qv*) is an equally remarkable Stone Age site. Northern Africa, India, South America, and some of the Pacific islands have important examples of this earliest form of the builder's art.

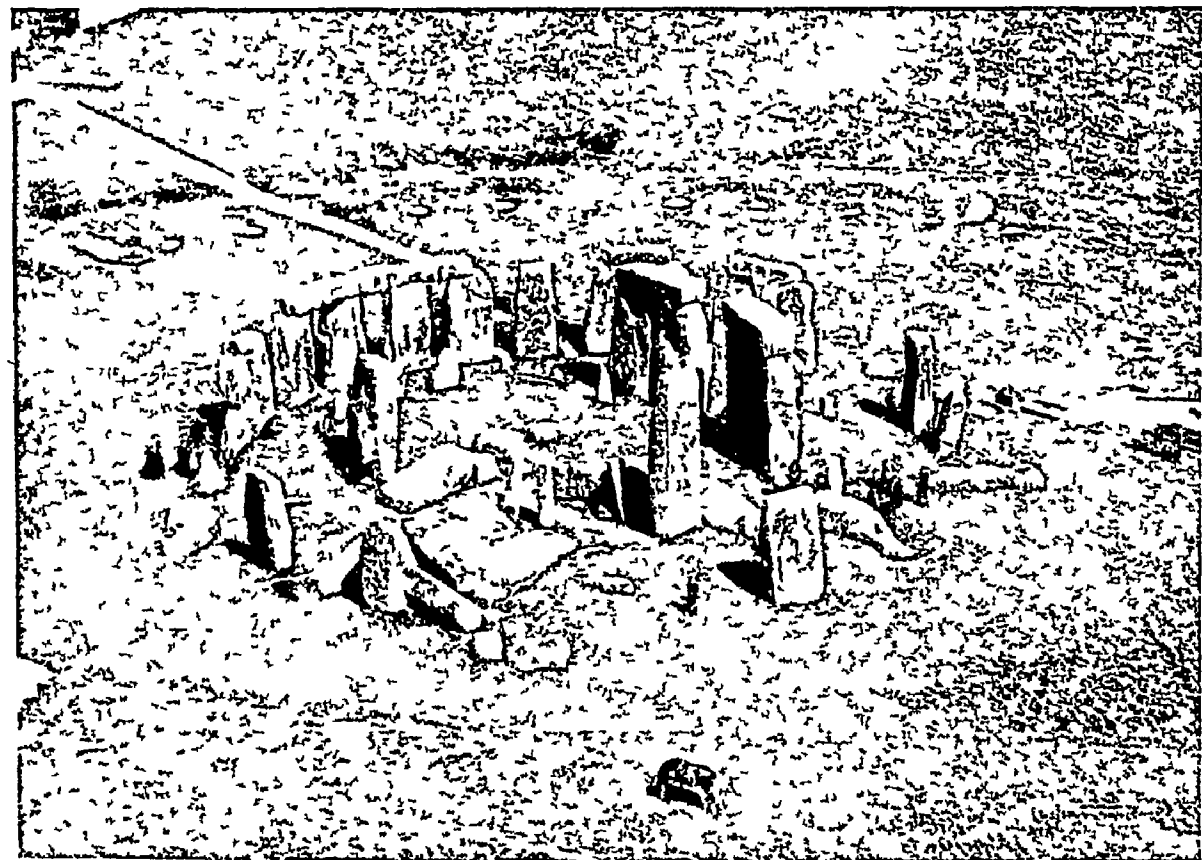
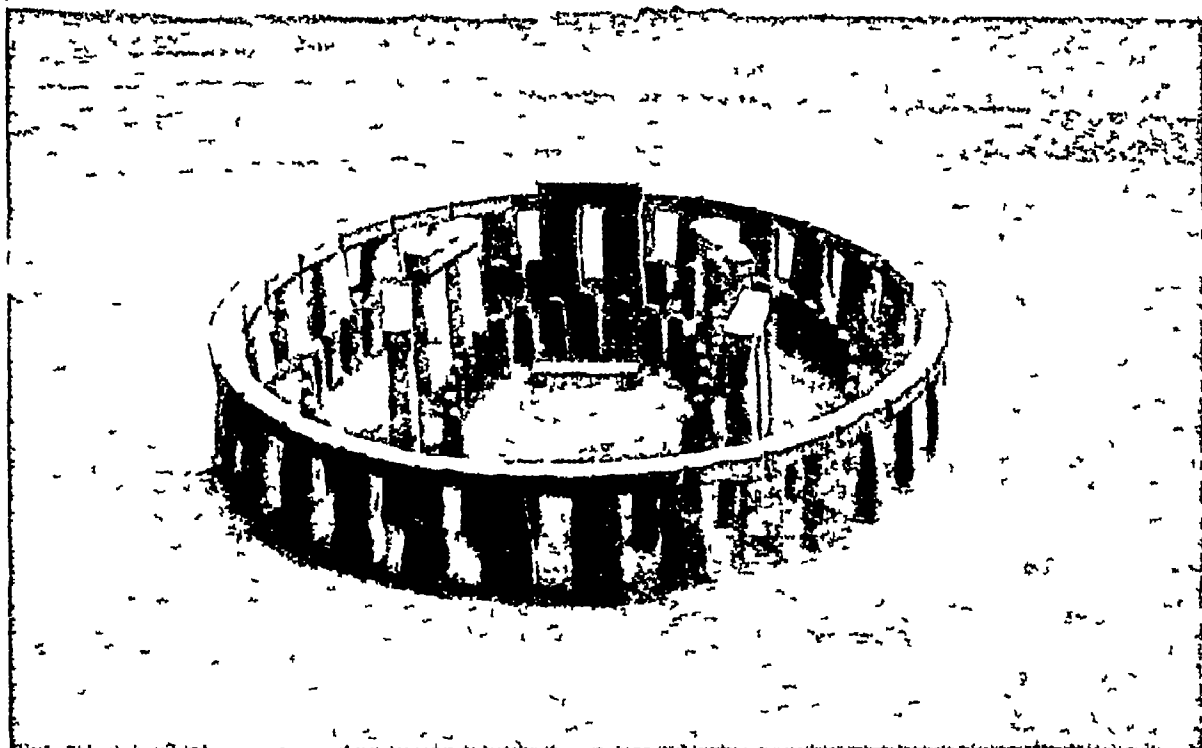
Frequently these monuments stand far removed from any stone deposits. How such huge blocks were transported and set up by primitive men will probably always remain a mystery. Some monuments of this kind have been traced to the Bronze and Iron Ages, but these are usually much smaller than those of the Stone Age. **Stonehenge.** On Salisbury Plain in Wiltshire, about seven miles north of the city of Salisbury, stands Stonehenge, the most important monument of antiquity in the British Isles. It is composed of an encircling earthwork



STONE AGE BURIAL: A KENT DOLMEN

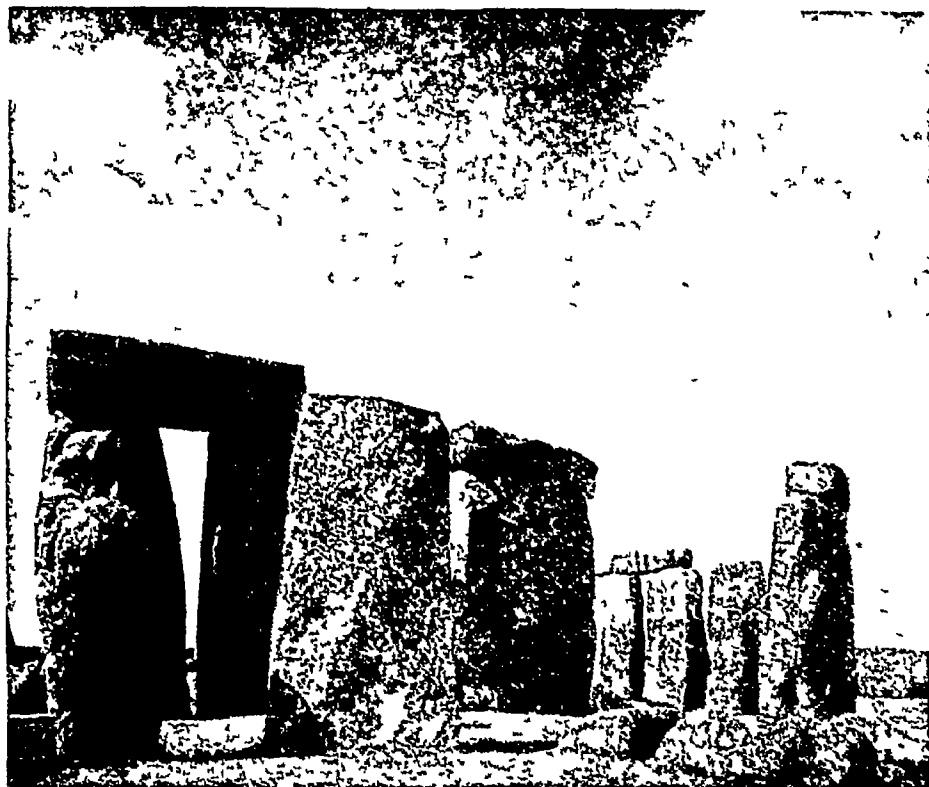
Dolmens are typical of the New Stone Age period in Europe. A table-like structure of vast stones, Kit's Coty House, at Aylesford, in Kent, is a good specimen of the less elaborate dolmen tombs. The body was placed within the dolmen—a kind of cave-burial, since the whole was heaped over with earth.

STONEHENGE IN RECONSTRUCTION AND IN RUIN



Of the prehistoric stone structures in the British Isles by far the most famous and impressive is Stonehenge, in Wiltshire. At the top of the page is a reconstruction in miniature of the monument as it probably looked originally. There is an outer circle of big stones, an inner circle of smaller stones, then five immense trilithons (two uprights and a cross-piece) in horse-shoe shape, inside which is another horse shoe of small stones and the large block called the 'Altar stone'. Below is an aerial view of Stonehenge as it appears today. On the extreme left is the "hele" stone or "Friar's Heel," across which at sunrise on Midsummer Day the sun's rays fall on to the altar stone.

Lower photograph by Aeroflms



Fox photos

MIGHTY STONES OF STONEHENGE

Now preserved as a national treasure, Stonehenge is generally held to be the most important "ancient monument" in the British Isles, yet no one knows for certain when it was built, though the date 1680 B.C. has been suggested. Standing on Salisbury Plain, seven miles north of Salisbury, Stonehenge is visited by thousands of tourists every year.

or ditch, and the remains of four groups of stones, two circular and concentric, and two inner groups roughly horseshoe-shaped and concentric. The outer circle of stones (now incomplete) has a diameter of 100 feet, and is represented by sixteen stones standing some 13½ feet above the ground and weighing each some 26 tons. These are joined at the top by heavy capstones. This outer ring is composed wholly of *sarsens*, a name given to sandstone when it occurs on chalky downs, as it does here in Wiltshire. Nine feet within the outer ring is another ring, also incomplete, which is represented by a number of bluestones, about six feet high. Then come the two horseshoe-shaped groups, the two largest members of which rise to a height of 22 feet, and are joined by a capstone. Within the innermost group lies the so-called altar stone, a slab of sandstone 16 feet long. The "hele" and "slaughter" stones are near by.

Measurement, excavation, and photography from the air have added greatly to our knowledge of the extent of Stonehenge, but we still do not know when or by whom it was built. Geologists say that the *sarsens* or sandstone blocks came from the Marlborough Downs, 14 miles away, and that the bluestones are identical with those of Pembrokeshire, South Wales, which is two hundred miles away. Obviously it must have taken a great amount

of time and labour for primitive men without mechanical resources to convey such heavy weights over such a distance as this.

Many years ago it was suggested that Stonehenge was a Druidical temple, and this view has gained wide popular support. Every year at day-break on Midsummer Day a rite is carried out by people who style themselves Druids. But in reality there is no evidence for associating Stonehenge with the Druids. The most reasonable theory seems to be that the ditch round it was dug late in the New Stone Age, and that the stone groups were added in the Bronze Age, when it became an important burial centre.

The site of Stonehenge was purchased in 1915 by Sir Cecil Chubb who generously presented it to the nation in 1918. Since then it has been under the charge of H.M. Office of Works, which is responsible for its care. **Storage Battery.** The electricity that starts the engines and operates the lights of our motor-cars is supplied from the ingenious appliance called the storage battery or accumulator. Electric vans run entirely on the current supplied by storage batteries, as do submarines when they are travelling under water. Storage batteries light our trains and omnibuses, propel the little locomotives and trucks that carry the heavy loads at wharves and large railway stations, run wireless sets of the older type, and are used for many other purposes.

It is common to think of the accumulator as if it were a device for actually storing electricity, like the Leyden jar. What it does is only to generate electricity as the result of chemical action, like any other sort of battery. But while batteries, once they have been exhausted, can be renewed only by putting in fresh solution and new positive plates, the storage battery can be revived again and again by merely passing a suitable electric current through it. (See Electricity.) The commonest form of storage cell contains dilute sulphuric acid in which positive lead plates coated with peroxide of lead are spaced alternately with negative plates of spongy



HANDSOME HERON AND CURIOUS CRANE

THE two birds which you see here look so much alike that you might well take it for granted that they are closely related. Yet, as a matter of fact while the heron (above) is a member of the same order as that which includes the storks and the ibises, the crane really belongs to a quite different group. It has, however, the long neck, long slender legs, and dagger like bill, which characterize so many members of the stork group.

The heron is the only stork like bird which breeds at all frequently in Britain, and it makes, as seen here, a huge platform of sticks in which to rear its family. These birds are sociable, and nest together—sometimes as many as fifty pairs inhabiting the same heronry. The nests are nearly always high up, and the nesting season begins very early in the spring of the year.

Top photo L. J. Langford



SACRED IBISES, CLOSE RELATIVES OF THE STORK



Capt C W B Knight

These wonderful birds, with their black, white and crimson plumage, are the famous sacred ibises of Egypt. In that country, however, they are no longer found, and indeed they are now so nearly extinct as to have been driven to a few isolated places as breeding haunts. In one of these haunts this beautiful picture was taken, it shows you the long wings, curved bill, and long, black legs of these strange birds, all indications of their relationship with the storks.

metallic lead, with separators, usually made of wood, between them. Each cell yields about two volts, the usual 6-volt battery consisting of three cells sealed together in a glass or celluloid case, with a ventilating cap over each cell, which can be removed to test the battery or to replace water that may evaporate from the solution.

When the battery is discharging, lead sulphate is formed on the plates, the acid solution growing

weaker. To recharge the battery, a direct current from another source is connected—positive to positive and negative to negative—so that electricity flows back through the battery in reverse direction. This restores the accumulator to its original chemical state. The hydrometer test of the solution shows a specific gravity of about 1.11 when discharged, 1.30 when fully charged. (See Hydrometer)

STRANGE STILT-WALKERS of BIRDLAND

The long-legged stork and its relations are among the most striking of all birds—in appearance, at least, but their strange length of bill, legs, and neck has a simple and interesting explanation

Storks, HERONS & THEIR KIN These are among the easiest of all birds to recognize, for they all have long legs, a long neck and a

longish beak, while they are also largely water birds.

The common white stork, *Ciconia alba*, the hero of fable, song, and folk story, found during the summer in most of the countries of Europe, breeds from southern Sweden to Spain and Greece, and winters in Africa and India. Its



favourite nesting-place is on the roofs of buildings. Storks are to be seen on many houses in Denmark and Holland, and old cart wheels are often placed to induce them to build there. The birds return to the same nest year after year, each season adding to the rough sticks composing their nest, until the pile sometimes reaches a height of several feet.

In Europe, storks are carefully protected, which accounts for their friendly confidence in human beings. This tall bird, with his white plumage set off by black, his red beak and legs is a beautiful sight as he moves about the meadows. The stork has no voice, and during the mating season, when other birds express themselves in song, he goes through the most grotesque antics leaping, bounding, and wildly flapping about with clattering beak.

The adjutant or marabout *Leptoptilus*, is a gigantic stork found in southern Asia and in Africa. Some species stand about six feet high and have a wing span of nearly fourteen feet. It gets its name from its military attitude and walk. The plumage is very untidy, but from the underside of the wing are taken the soft fur-like marabout feathers so popular as a trimming. In villages and towns of India this bird may be seen stalking about the streets, where it acts as a scavenger. (See illus. page 32)

Another interesting bird is the shoebill, or whale-headed stork, an inhabitant of the Nile region. This weird bird, with its beak like a huge shoe or shovel, feeds in the mud of the river.

Closely related to the storks are the ibises. The sacred ibis, *Ibis aethiopica*, was revered by the ancient Egyptians. It was the subject of many superstitions, and at death was mummified, many bodies having been found in the tombs of ancient Egypt. Though now unknown in Egypt, it still breeds in other parts of Africa.

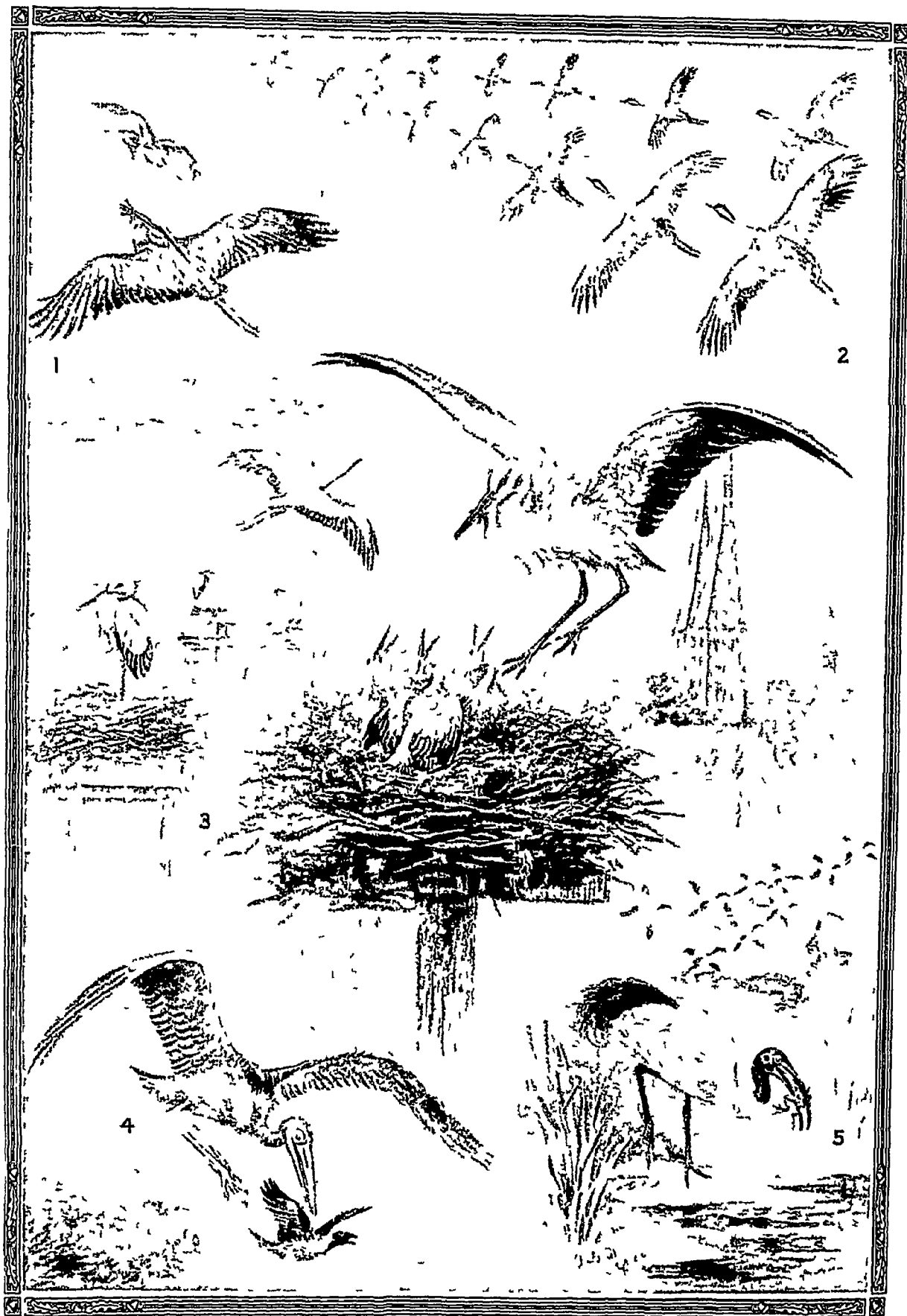
The spoonbill is a relative of the ibis. It has a long, broadly expanded bill, with which it gathers insects and other water dwellers from



THE ODD LOOKING SPOONBILL

Once numbered among our breeding birds the spoonbill is now a rare visitor, it is protected as otherwise its occasional visits would usually result in its death by the gun of a collector. Like most members of the heron group it has plumes at the back of its head and its general colour is white. The strange shape of the bill allows this bird to feed easily in the soft mud.

THE STORK AND SOME OF ITS RELATIVES



Here are various interesting episodes in the lives of the stilt-walkers in feathers. 1 Common Herons in flight from a feeding ground. 2 Cranes in wedge formation in migration time. 3 When Mother Stork comes home from market. In the background are several others, standing about on one leg, and surveying the landscape from chimney tops. 4 An Adjutant of southern Asia about to catch a hooded crow. 5 The Sacred Ibis of Egypt dines on frog.

STORKS

the mud in shallow water. The European spoonbill is white, it once bred in Britain, but is now a rare visitor, and is usually shot on sight by collectors.

The egrets (*Egretta*) comprise some of the most wonderfully adorned birds of the western world. The plumage is pure white, and during the mating season the birds wear a magnificent train of long plumes springing from the back. These are the aigrettes or "ospreys" of the feather trade. At one time these birds were slaughtered for their plumes in a



EXTRAORDINARY SHOEBILL

This is one of the strangest of birds, for its body and general build are the same as those of other members of the stork family, while its beak, as you see, is a large and cumbersome affair. The beak is useful, however, being adapted to feeding among the mud and slime of the Nile valley.

waters, they have a loud, trumpeting call.

Our only native British member of this group is the heron, *Ardea cinerea*, one of our largest and finest birds, whose plumage is grey and white. Sometimes he stands with his head erect, looking calmly around, at others, the long bill is sunk on his chest, his neck curved into an S shape, and at others, again, he may stride in a lordly way through the water. In flight, he is easy to recognize, with the slow, steady beats of his powerful wings carrying him



ruthless, horrible manner. The trade in these plumes was stopped by international action, and now the "aigrettes" are obtained from other birds.

The crane (*Megalornis grus*) looks like the heron, but belongs to another order, *Grui formes*. Although so large, the crane is closely related to the little rail. The female lays her two—or sometimes three—eggs in a nest built upon tufts of marsh grass. Cranes feed principally on the vegetable and animal life of the swamp, and also often plunder newly sown grain fields. Owing to their fine appearance and stately bearing they are popular in parks and on ornamental



SACRIFICED TO FASHION

These pictures show the shameful way in which egret families were sacrificed when plume hunters came along to secure aigrettes for the millinery trade. 1. Mother egret keeping the newly-hatched fledgelings warm. 2. The mother bird shot by a plume hunter. 3. Baby egrets crying for food. 4. The orphaned fledgelings dying from hunger.

along much faster than appears to the eye.

The heron feeds on fish and other creatures found in or near the water and the mud flats, capturing them usually by a single, lightning dart of his bill. Sometimes, however, a strong eel can twine itself round the bill, and herons have been picked up dead, drowned when they could not release their own victims, which have died too in the struggle. Because of their fondness for young fish, herons are disliked where trout are preserved, but they are nevertheless common in many parts, and may even be seen in London. They breed in heronries, a number of pairs combining to form these tree top

STORKS

colonies, where the vast masses of sticks are occupied very early in the year. The eggs are large, bluish in colour, and the young birds are very strange and gawky creatures before they have their full plumage and have left the nest. Sometimes, where there is little fear of their being molested by Man, herons breed in low trees, and they even make their nests among the reeds in the waters of a lake. The bittern (*q v*) is a relative of the heron, and is also sometimes found in Britain.

Storms. A storm, we might say, is nothing but unusually violent weather. High winds are a conspicuous feature of most storms. When the wind rises over 40 miles an hour, we call it a gale. A storm with wind over 75 miles an hour is called a hurricane.



MENACING VANGUARD OF THE STORM

Monstrous masses of cumulo-nimbus cloud, such as you see above, are often the forerunners of appalling thunder-storms. Their summits are then coppery-red, their bases dull purple grey, and their whole appearance is terribly menacing. Some of these clouds contain many cubic miles of vapour, which is discharged in torrential rainfalls.

In Chinese waters such a storm is known as a typhoon. The sailor-novelist, Joseph Conrad, gives a vivid account of such a storm in his great story "Typhoon." Among the signs which foretell hurricanes are a dull red sunset caused by a thin haze of clouds, hot humid air, an unexpectedly high barometer, with a dying down of the wind, and, if at sea, a growing swell. Then, suddenly, the barometer drops again, a rain cloud rushes forward from the horizon, and a deluge seems to fill the air with water, while the wind blows with great force.

These hurricanes are intense cyclonic storms, with winds blowing toward a central region of low atmospheric pressure. (See Meteorology)

STORMS

The winds blow spirally, instead of straight toward the centre, because they are deflected by the rotation of the earth, anti-clockwise in the northern hemisphere and clockwise in the southern. (See Winds) Sailing ships avoid the dangerous central region of low pressure by taking the wind from the starboard, or right, in the northern hemisphere, and from the left in the southern. The ship then sails toward calmer weather at the edge of the storm. Sometimes a ship passes through a storm into an area where all seems calm and serene, and then runs into the storm again. The deceptive calm was the centre, or "eye" of the storm.

Tropical cyclones do terrific damage to shipping, crops, trees, and buildings. They cause waves which sometimes flood cities and

cause loss of life. The power required to keep such a storm going probably comes from the heat which is released when moisture is condensed to rain within the storm. This heat keeps the air pressure low at the centre of the storm, and, as long as the low pressure persists, the storm continues. A typical hurricane may generate over 100,000,000,000 horse power.

Thunder-showers are caused by moist air rising, cooling, and condensing its moisture. The most common kind is the hot afternoon storm, when the towering clouds build themselves into masses that rise in billowing curves above a flat base, and get

darker and heavier with moisture, as they rise higher and higher. (See Clouds)

Everyone has watched the various stages of a thunder-shower—the heavy nimbus cloud, the descending rain, the squall caused by the rising and sinking air at the front of the cloud, forming a whirl, and the broken clouds following after. Lightning, thunder, and hail accompany these storms as a general rule. The power that is represented by them is tremendous. A one-inch rain over 10 square miles requires as much as 232,300,000 cubic feet of water. To evaporate and condense this water at 50° F during the lifetime of the storm takes more than 36 million horse-power—a fact which dooms to failure

A UNITED STATES TORNADO SEEN IN ACTION



Noting an unusual storm approaching, a photographer in Nebraska had his camera ready and was rewarded with this perfect picture of the funnel shaped tornado or "twister" which swept over his town causing much damage. Notice how the bottom of the funnel is above the ground rather than touching it. This tip will be above tree tops at times and an instant later will touch the ground. Like other states of the Great Plains region Nebraska is often visited by such storms.

STORMS

all efforts to "make rain" In the tropics it is common for regions to have 200 such storms during the year, or rather to have 200 days recorded as having thunder-showers The path of a thunder-shower is far shorter and narrower than that of a hurricane or cyclonic storm, and its duration is usually only for a few hours The Air Ministry estimates that some 1,800 thunder-storms are in progress somewhere at any given moment

Tornadoes arise when the conditions that cause thunder-storms are unusually violent By centrifugal action, the air is thrown away from the centre of the whirl, thus leaving a core of low pressure—perhaps only 1/10th of normal

In the Tornado's Path

Because of the suction in this low-pressure core, houses collapse and roofs are carried off, corks are drawn from bottles and window panes explode outward Around the edge of the whirl, the wind may blow at 200 miles an hour The whole world seems one great roar, as the storm moves eastward at 25 to 40 miles an hour A tornado is only a few thousand feet wide

A waterspout is a tornado at sea, sucking in water at its base, and carrying the water spirally upward with the wind to the overhanging cloud
Stratford-on-Avon. In this ancient Warwickshire town, 93 miles north-west of London, Shakespeare was born, and here he died Both he and Anne Hathaway, his wife,

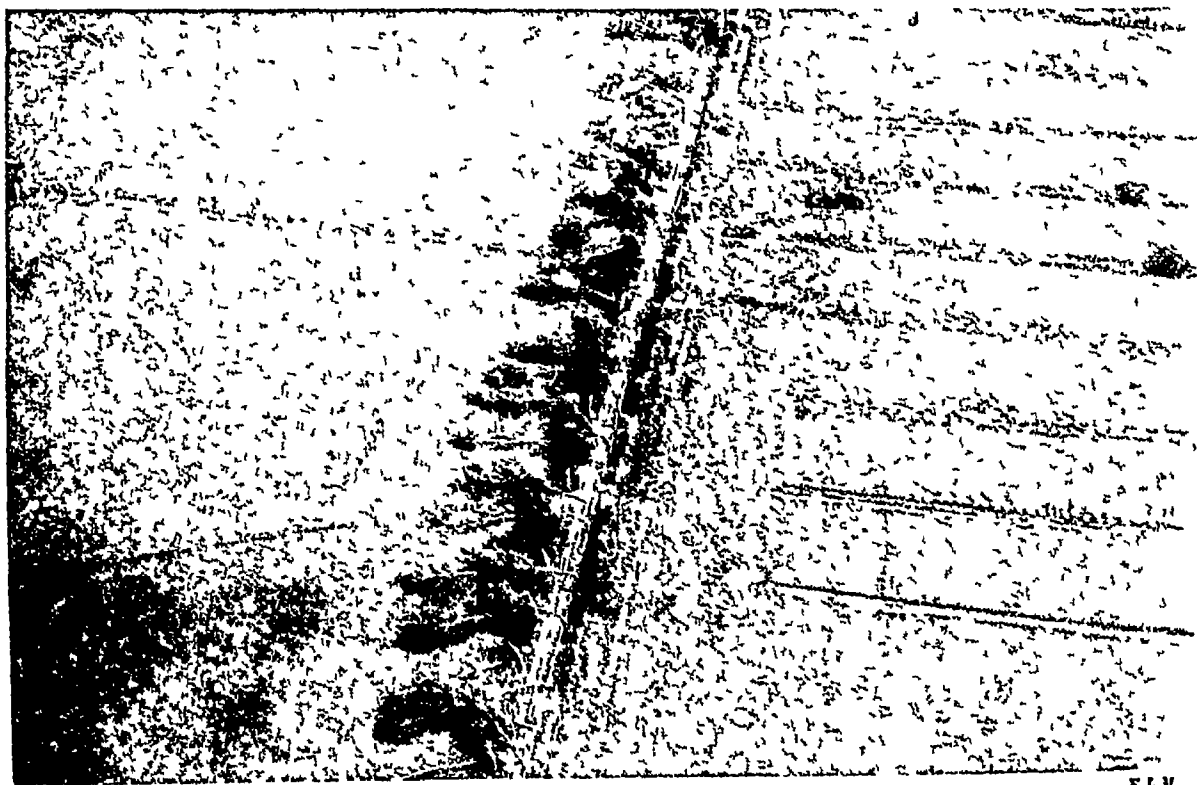
STRATFORD

he buried in the church of the Holy Trinity On the slab over his grave is the famous inscription, said to have been selected by Shakespeare himself

Good friend, for Jesus' sake forbear
To digg the dust enclosed here,
Blest be ye man that spares thes stones,
And curst be he that moves my bones

Though commercialized, the town is not entirely spoilt As Sir Sidney Lee says "The chief streets still bear the names by which Shakespeare knew them The stone bridge across the Avon is in all essentials the same as when the Elizabethans crossed it The water-mill, although shaped anew, continues to do the noisy work in which it has persevered through the centuries"

The reputed house of Shakespeare's parents, which contains the small whitewashed room in which he is said to have been born, is still preserved On the walls of this room appear signatures of innumerable distinguished visitors, among them those of Sir Walter Scott, Thackeray, and Dickens The house serves in part as a museum of Shakespeariana A Shakespeare memorial building erected in Stratford, including a theatre, a gallery of paintings, and a library of his books, was burnt down in 1926 A fine new Memorial Theatre on the banks of the Avon was opened



E. L. M.

TREES LAID FLAT BY THE TORNADO'S TITANIC FORCE

The results of a tornado must be seen to be believed, its force is terrific. Look at the photograph above, which shows one result of a gale that struck Holland with cyclonic force in June, 1927 The gale created widespread damage in the province of Gelderland In this aerial photograph, wayside trees near Lichtenvoorde are seen snapped off as though they were but matchsticks The same tornado stripped many houses of their roofs and tore the windows from their frames



"The Times"

SHAKESPEARE MEMORIAL THEATRE AT STRATFORD ON AVON

The series of annual Shakespeare Festivals held at Stratford-on-Avon dates from the opening of the first Memorial Theatre on April 23, 1879. This theatre was destroyed by fire in 1926 and the new theatre, seen above, built to the design of Miss Elisabeth Scott, A.R.I.B.A., was opened in 1932 on April 23, the date assumed as Shakespeare's birthday. Many distinguished players have taken part in these annual Memorial productions, which now run from April to September. In connexion with the performances many lectures are given by Shakespearean authorities.

in 1932. The little thatched cottage in which Anne Hathaway was born is at Shottery, about a mile from Stratford. At Wilmcote is the cottage of Shakespeare's mother, Mary Arden. The population of Stratford is about 11,600.

Strathcona, DONALD ALEXANDER SMITH, 1ST BARON (1820-1914) "The Grand Old Man of Canada," as he was called in the later years of his long and brilliant career—the man to whom in large measure western Canada owes its splendid and rapid economic development—was born in a little stone cottage near the town of Forres, Scotland.

Before he was quite 18, Donald Alexander Smith left his simple home to seek his fortune in the New World. He entered the service of the Hudson's Bay Company, which at that time controlled most of what is now the Dominion of Canada. For 13 years he roughed it in the dreary wilds of Labrador. Then he spent 10 years more in the Canadian North-West. He mastered the fur trade, found time to read and study, and eventually became resident governor of the company, with headquarters in Montreal.

Fur traders, Indians, and half-breeds all respected and trusted Donald Smith, and when the rebellion under Louis Riel broke out on the Red River in 1869, the Canadian Government appointed him special commissioner to deal with the rising. When, in 1870, the Province of Manitoba was organized, he was elected to its first legislative assembly, and he was long a member of the Canadian House of Commons.

A man of understanding and vision, he saw that if Canada was to become a great country, if the distant parts of this vast territory were to be knit to the centre, it must have a transcontinental railway. It was largely through his ability, and the use of his own fortune, that the Canadian Pacific Railway was completed in 1885.

Of his vast wealth he gave huge sums to McGill University and many other institutions. During the Boer War of 1899-1902 he raised and equipped at his own expense a regiment of 600 men—Strathcona's Horse.

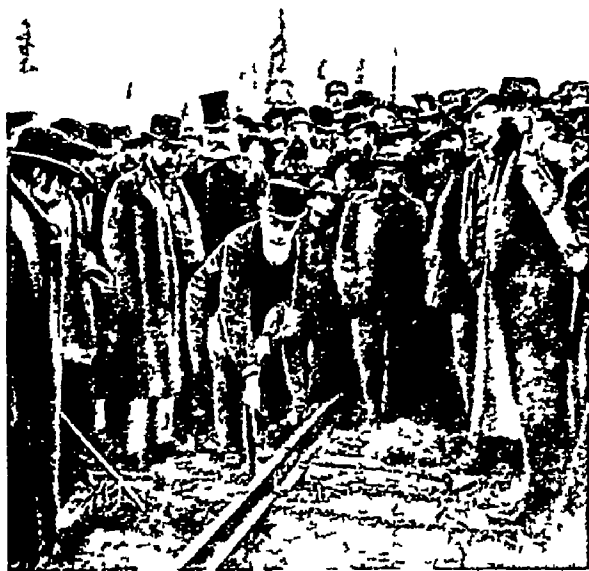
Donald Smith was knighted by Queen Victoria in 1886, and in 1897 he was made a Baron as Lord Strathcona and Mount Royal. In 1896

WHEN STRATHCONA WAS SENT TO LABRADOR



ARCH WELLS

Fearing that he was in danger of losing his eyesight, Donald Smith (later Lord Strathcona), having received no reply to his inquiries for permission to consult a doctor, took "French leave" to obtain the advice he sought. For this he was punished by being ordered to leave at short notice for a post in Labrador, a journey which meant almost unendurable hardship and possibly death from privation. He arrived after months of weary travel, one of his Indian guides having died on the way.



STRATHCONA COMPLETES THE C.P.R.

To Lord Strathcona, whose vision and administrative ability made its construction possible, fell the honour of completing the great Canadian Pacific Railway by driving in the last spike, which was made of gold

he was appointed High Commissioner for Canada in London, and from that time until his death, in his 94th year, he was a prominent public figure. Few men did more than he to strengthen the bonds between Canada and the Mother Country.

Strauss, JOHANN (Pron strows) (1825-1899) The man who was to set Vienna and the world dancing in waltz time was the eldest son of another famous Johann Strauss (1804-1849), who himself wrote dance music in the Viennese tradition, and was, moreover, probably the most popular conductor of his time.

Strauss the elder forbade his sons to take up his profession, but Johann, a musician to his finger-tips, passed only a few miserable years as a clerk, and in 1844 defied his father by conducting his own orchestra in a public restaurant, and including his own compositions in the programme. After his father's death, Strauss succeeded him as conductor of his orchestra, and in 1863 became conductor of the Viennese Court balls. As a composer he soon outdid even his father's fame with such astonishingly successful waltzes as "The Blue Danube" (1867), "Morning Papers," and "Tales from the Vienna Woods." His light operas, full of flowing and rhythmic melodies, were equally successful and popular, they included "Die Fledermaus" (The Bat), 1874, his masterpiece in this genre, "A Night in Venice" (1883), and "The Gipsy Baron" (1885). Strauss, who was the acknowledged master of waltz composition in the Viennese tradition, composed nearly

400 waltzes, all of a uniform high standard, as well as polkas, mazurkas and galops. He died in Vienna on June 3, 1899.

Strauss, RICHARD (Pron strows) (Born 1864) The most talked of musician of the early 20th century was Richard Strauss, for in most of his compositions for orchestra he cared little for beautiful melodies, but rather tried to make his musical picture real. To do this he did not hesitate to employ discordant tone combinations and to use the instruments of the orchestra to produce extraordinary imitative effects.

Richard Strauss was born at Munich, in Bavaria. At four years he played the piano well, at six he was composing, and at ten he was seriously studying. Up to 1890 his compositions were not outstanding, and he was known chiefly through his position as conductor of the Munich opera, rather than as a composer.

From this time on, his compositions became increasingly realistic. Storms of criticism, ridicule, and abuse followed the appearance of each new work. However, time and familiarity have done much to reconcile the public to his methods, and his place is now among the foremost composers and conductors of the day. In 1898 he settled in Berlin as conductor of the Royal Opera.

Of Strauss's operas, "Salome" (1905) has probably been the most discussed, and his



E.A.A.

RICHARD STRAUSS CONDUCTS

In addition to being one of the foremost German composers since Brahms, Strauss is also a conductor, his first post having been that of assistant conductor to Bulow at Meiningen. Above, he is seen conducting an orchestra in the open-air Stadium at Athens.

STRAWBERRY

"Rosenkavalier" (1911) the most liked (*See* illus in page 3055) His symphonic poems have given rise to violent discussion, but his songs, by then unfailing melodic beauty and delicate charm, have been universally accepted and have given Strauss rank as one of the great lyric masters

Strawberry. This delicious fruit gets its name from the practice of putting straw round the plants to keep the fruits clean, for their appearance is an important factor if a good price is to be obtained. They are grown especially in Hampshire and other southern counties, and each bed is seldom kept in bearing more than a year or two. New plants are usually obtained from the runners which are sent out by the old plants every year. These are placed about 2 feet apart, with about 3 feet between the rows, on rich, well-cultivated ground. After cultivation is discontinued, and usually after the bearing season, the fresh runners loop out from the parent plant and root new plants where they touch the ground.

The little wild strawberry (*Fragaria vesca*) of our woods and hedges was the first species cultivated. Species from Chile and elsewhere were introduced later, and by careful crossing the countless varieties of today have been produced. The fruit actually consists of the swollen, pulpy receptacle of the flower, in which the seeds are embedded. The barren strawberry (*Potentilla fragariastrum*), one of our earliest spring blooms, is a different species, though both are members of the rose family.

Stuart. The name of a Royal family of Scotland and England. Robert II (ruled 1371-1390), the son of Walter Stewart and Marjory (daughter of Robert the Bruce), was the first Scottish ruler of the line. Robert III, James I, II, III, IV, and V, and Mary followed him.



F. J. Bedford

RIPE WILD STRAWBERRIES

Although they are smaller than the favourite fruits of the garden, the wild strawberries have a no less delicious flavour, and those you see here would make a very juicy mouthful. The fruits are deep red, but the flowers are white.

STURGEON

Mary Queen of Scots changed the spelling of the name to Stuart.

James VI of Scotland, Mary's son, on the death of Queen Elizabeth became king of England as James I (1603-1625), thus uniting England and Scotland under one crown, though the two countries remained independent in every other respect. Charles I (1625-49) followed James I. The Stuart succession in England was interrupted by the Commonwealth, but was resumed (1660) at the Restoration with Charles II (1660-1685).

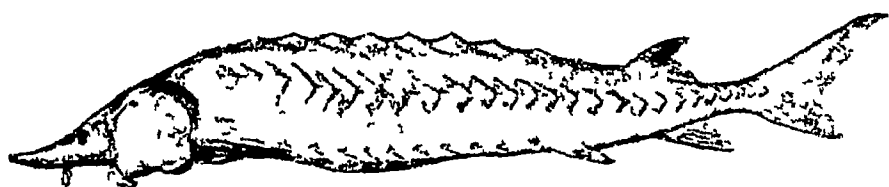
The remaining rulers of the house were James II (1685-88), his daughter Mary, who

ruled jointly with her husband William III from 1688 to 1694, and Anne (1702-14), Mary's sister who became Queen upon the death of William in 1702. The attempt to put back the Stuarts on the throne caused the Jacobite Rebellions of 1715 and 1745 (*See* Jacobites, Pretender).

Sturgeon. Caviare and one of the best sorts of isinglass are two valuable products of the sturgeon. Caviare, beloved of the epicure, is prepared from the eggs (roe) taken from the female sturgeon, and isinglass is made from the inner membrane of the fish's swim-bladder.

The sturgeon (*Acipenser sturio*) is a large bulky fish with a long body, a skin covered with five rows of large bony plates, and a conical and tapering snout. Scientifically it is of interest, for it is a member of the cartilaginous group (*see* Sharks), and remains of its ancestors are found in some of the oldest rocks.

There are about twenty-five species, which vary greatly in size, one species of the Black and Caspian Seas reaches a length of 24 feet and a weight of 2,000 lb. On the other hand, some are rather small, such as the sterlet, which rarely exceeds a length of 3 feet. Most species live in the sea, a great part of the year, ascending rivers to spawn, though a few are entirely fresh-water fishes. In Britain the sturgeon is a "royal" fish, any caught in territorial waters belonging to the Crown.



'ARMOUR-PLATED' STURGEON

H. H. Goodchild

If you see a truly enormous fish in any of England's larger rivers, it will probably be a sturgeon like this one. This curious monster among fishes has a long snout, below which hang sensitive barbels by which it feels its way about. Its small mouth is also on the underside of its snout, and its skin is protected by plates of horny armour.

